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Some Aspects of Museum Laboratory Work*

by H. J. PLENDERLEITH

IN 1920 a research laboratory was established by the Department of Scientific and Industrial Research at the British Museum under the direction of Dr Alexander Scott, F.R.S., to carry out a particular task, namely, the restoration of museum objects which had suffered as a result of an enforced evacuation underground during the last war. Several years were required to complete the work, which involved the development of safe methods of arresting the decay of materials as diverse as paper, vellum, leather, wood, bone and ivory, stone, fur and feathers and metals.

During this time new problems were constantly arising—questions as to the age and authenticity of objects of art, questions regarding methods of ancient craftsmanship and the composition of the alloys used by different cultures and for various purposes. The laboratory soon became an indispensable institution. It increased in scope and size, and following a recommendation of the Royal Commission on National Museums and Galleries it was eventually incorporated as an independent Department of the British Museum.

This is the twenty-first anniversary† of the foundation of the British Museum Laboratory and it is fitting, therefore, that some account of its activities should be given to mark the event. Its principal feature is perhaps the many-sided nature of the work undertaken; and its most important activities, judged by the numbers of objects dealt with, are related to the corrosion of metals, a subject which is of

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† The paper was read 3 November 1941.

general interest. We are concerned with short term active corrosion which may be very damaging to museum specimens, and we are concerned with the long term corrosion which objects suffer in the ground and which may have been going on intermittently for hundreds of years —the gradual reversion of metals to the mineral condition which is the ultimate condition of stability in nature.

For the student of antiquities corrosion has a three-fold significance.

In the first place, if left unchecked, it may destroy the object affected, obliterating ornament, distorting the shape of the specimen and eventually reducing it to an uninteresting ruin. Corrosion therefore provides practical problems in the restoration of antiquities, which are often of great urgency and intricacy.

In more fortunate circumstances, as when corrosion takes place slowly and uniformly, the result may be the formation of a protective skin consisting of thin surface layers of inert minerals called patina. The word patina should convey, strictly speaking, the idea of stability, and usually of smoothness and pleasing colour ; it is convenient in practice to use it rather loosely as the equivalent of incrustation.

The third aspect of the matter is that, by a study of the nature, extent and dispersion of the corrosion products, one can assess to a certain approximation the composition of the alloy, and what is often more important, one can sometimes get valuable evidence as to the antiquity of an object, its provenance and genuineness. It is obvious that a corroded surface offers more scope for investigation by non-destructive methods than metal which is still bright and unattacked, and methods which are non-destructive are of particular importance when it is a question of studying objects which are unique and often of great value.

I propose to consider these three aspects of corrosion, from the museum laboratory standpoint, dealing in general terms with the metals which were used in antiquity and in more detail with bronze and silver ; and I shall illustrate how such studies are applied in the cleaning and preservation of museum objects and also in the routine examination of antiquities which are alleged to be genuine, but which, for one reason or another, have been regarded with suspicion.

1. Destructive effect of corrosion in the ground and after excavation

The metals used in objects of antiquity are gold, silver, copper, iron, lead and tin, but few among them are found in a pure state.

Gold and silver objects are commonly debased with copper ; gold generally contains some silver as well, and when silver is present to the extent of about 50 per cent. the alloy is known as electrum. Silver and copper objects may be made from fairly pure metals, but the silver generally contains some copper and a little gold. Of the copper alloys, the most frequent are the tin bronzes, the commonest minor constituent being lead. Brass we need not be concerned with as it is of later occurrence.

The nature of the metal or composition of the alloy has an important influence in determining the chemical composition and structure of the mineralized incrustation resulting from corrosion. When buried in the ground metals are affected to a greater or less extent by the acidity or alkalinity of the soil, and the presence of soluble salts has a far-reaching effect on the rate of decay, especially when the ground is porous and humidification periodic. Where different metals are in contact in presence of an electrolyte, galvanic action is a potent agency of destruction, and corrosion is to be expected also where there is contact with organic remains, as when ritual bronzes or objects of silver are buried with the dead.

The effect of burial on gold alloys is generally that there is some superficial enrichment, because any baser constituents of the original metal are oxidized and in time removed from the immediate surface. Gold objects from excavation thus appear to the eye of higher carat than, in fact, is the case. Occasionally there is a rather loosely adherent brownish-red powdery film on the surface, somewhat like jewellers' rouge in appearance. This is cuprous oxide. No form of cleaning is required to effect preservation of the gold, and, indeed, it is undesirable on aesthetic grounds as it causes a loss of colour ; if there should be much silver present in the alloy, the metal may go quite white if it is rubbed.

When metallic silver has been buried in the ground for a long time, the effects of corrosion are much more obvious. A variety of possibilities is presented in regard to the structure and appearance of the corrosion products, but the principal constituent is usually silver chloride, and the incrustation or patina is generally stable. When the surface film is thin it may vary in hue from a chalky pink or violet to jet black ; in its grosser forms, i.e. when the incrustation is appreciably thick, there is considerable surface expansion and consequent craquelure. An incrustation of horn silver may be warty and uneven, especially if copper is present, owing to secondary reactions having

taken place ; it is of slate grey or brownish colour giving the object somewhat the appearance of old cracked leather.

Brittleness is a characteristic of old metallic silver, whether it be corroded or otherwise, and irrespective of whether it has been buried or not. In the heavily corroded state the strength of a silver object may be mainly that of the horny incrustation. The object may be warped and twisted as a result of irregular expansion or crushing during burial, and the greatest care is required in handling specimens in this category before they are annealed. If it should be desirable to fold back a crushed object to its original shape, annealing must be carried out frequently and with the greatest care as the work proceeds, otherwise the operation will certainly end in disaster.

When silver is in contact with baser metals, such as copper and its alloys in the ground, the silver is unattacked so long as the base metal is corroding. The silver, indeed, may become submerged beneath a green deposit of copper salts, so that it is unrecognizable until the green deposits are dissolved away. Formic acid is very effective for this purpose and has practically no action on the silver unless it should be a very base alloy, when the object may be somewhat etched. It is usually entirely adequate as a cleaning agent in such cases. Solvents such as ammonia, hydrochloric acid and cyanides are more drastic in action and seldom necessary.

In comparison with silver, metallic copper shows greater variety in its corrosion products. The visible first stage is the formation of a film of cuprous oxide, which, if chlorides are present, as indeed they generally are, will be discontinuous and uneven. Such a film contains more or less isolated spots of pale green powdery matter where the action of the chlorides is most intense. These spots contain cuprous chloride. In later stages of corrosion in the ground, the cuprous oxide becomes covered with a green incrustration consisting usually of basic carbonate, but the chlorides remain at least potentially active in the incrustation.

When copper is alloyed with tin or zinc, the rate of corrosion in given circumstances is greatly increased. Tin bronzes recovered from the sea or from very salty ground, such as the Egyptian desert, are often completely mineralized, no actual metal core remaining ; some red or dark brown cuprite can always be discovered under the surface layers of green minerals. The presence of cuprite as a feature in the gradual mineralization of copper and its alloys is of significance, as will appear later, in helping to distinguish counterfeit patinas from those which have formed by natural decay over a long period of time.

The nature and incidence of the incrustation on objects of bronze is by no means so uniform as on copper objects, and bronzes corrode more quickly than copper and suffer much more in the process. When an alloy of copper and tin has been imperfectly mixed before casting, corrosion will eventually take place unevenly ; there may be an absence of corrosion in some places and extensive disintegration in others. When a heavy bronze object, such as a spear-head, for example, is covered by a thick incrustation of minerals, the corrosion products can sometimes be removed by mechanical means to reveal the bronze apparently little the worse in shape though smaller in size than it was originally. The outside layer of malachite is firmly attached to a casing of cuprite and these layers break away together along a stratum of tin oxide which, as it retains its powdery nature, acts as a line of cleavage. The core beneath the tin oxide, though it may appear metallic, always contains much cuprous oxide. This oxidation is mainly of an inter-crystalline character and in places may penetrate surprisingly far into the heart of the metal.

In concluding this preliminary review of the main effects of corrosion on metallic antiquities, reference must be made to iron and lead. These metals have this in common, that corrosion can and often does proceed to the limit, i.e. until no metal remains.

As in the case of silver and copper, the rusting of iron is accelerated by salts, and by chlorides in particular, in presence of water and oxygen ; it is accompanied by expansion and often by cracking and is progressive in its action when salts are present in the incrustation and conditions are sufficiently damp to permit of their reaction. Prolonged corrosion causes great distortion. As long as a sound core of metal remains under the incrusted corrosion products there is hope that chemical treatment may reveal hidden details of interest—the maker's name on a sword, for example, or fragments, at least, of chasing or damascened ornament.

Under museum conditions, metallic lead generally gives rise to the basic carbonate on corrosion. There is considerable expansion and the physical nature of the corrosion product determines whether or not there will be anything of interest left to conserve. If the basic carbonate should form a coherent skin, it may be stabilized by suitable impregnation, or removed by dilute acetic or nitric acids or even on occasion reduced back to metal. When, as often happens, the basic carbonate takes the form of a discontinuous powdery mass there is nothing to be done as the archaeological interest of the specimen is already beyond recovery.

When objects are excavated after prolonged burial in the ground, it is usual to find that corrosion is no longer of an intensively active character : a state near to equilibrium is in fact often established in process of time in the soil, the remains of the metal being protected by a hard shell of corrosion products. Certain damage to the metal has of course already taken place as a result of burial. But excavation upsets the equilibrium by exposing objects to considerable changes of temperature and humidity. Soluble salts become concentrated in the incrustations and secondary reactions occur, which will develop further when the objects are packed for transport or storage or brought into a building. A new phase of corrosion sets in, therefore, and if unattended to, may be more damaging to the metals and in a much shorter space of time than the earlier attacks which took pace in the ground before the objects were disturbed. The truth of this observation is most apparent in objects from salty desert country.

When chlorides are active in the incrustation of bronzes, there is often a general tendency on the part of the mineralized surface to become powdery and disintegrate ; often there is a characteristic and equally destructive form of decay consisting of spots, of white or light green powder which soon spread, and these spots are recognized as an early stage of general disintegration. This spottiness is widely known as the ' bronze disease ' though the reactions, of course, are entirely chemical or electrochemical in character. The nomenclature has at least this is its favour that it suggests that damage is being done and that the trouble is not likely to cure itself without the application of a remedy.

Where iron objects are concerned, chlorides in the oxide layers give rise, even under museum conditions, to beads of moisture ; local corrosion commences and soon will spread, forming rusty red damp patches as disintegration proceeds.

The only cure for active corrosion in metals contaminated with chlorides is the complete removal of these salts—soluble chlorides by washing with distilled water ; insoluble oxychlorides by chemical decomposition and conversion to soluble salts which can be eliminated. Early treatment after excavation is essential if the objects in question are to be conserved to the best advantage.

One is handicapped as regards treatment when there is little free metal remaining ; it is then unwise to apply any drastic chemical or mechanical process of cleaning, because when the incrustation is softened or removed, the object may be greatly weakened and in any

case it is certain to lose in archaeological importance. Sometimes one has to be content with prolonged washing in running water to remove as far as possible the soluble salts. Distilled water is used latterly and the wash waters frequently changed until, when tested with silver nitrate, they give no further chloride reaction. Drying follows and the object is then impregnated while still warm with a transparent lacquer, such as polyvinyl acetate in toluene. This is often the best one can do and it may suffice if the object is kept after treatment in a dry place. As basic chlorides still remain, there can be no guarantee that corrosion will not break out again if the specimen should be exposed to damp or to wide variations of humidity.

It may be affirmed at this stage that no impregnating medium or method exists which will cure corrosion when the cause has not been eliminated. Some processes may arrest it temporarily, such as boiling for a long time in wax, but the final condition is worse than before because the presence of wax makes it all the more difficult in the long run to get rid of the salts.

There are of course cases where cleaning is not a matter of urgency, though it may be desirable ; and there are cases where cleaning in some degree is essential if an object is to be saved, though on other ground the less that is done to the specimen the better.

As an example of the first category where cleaning is desirable but not urgent, we may instance the case of an apparently stable incrustation covering an inscription in the metal or concealing ornament. Local chemical treatment may be possible but is inclined to be out of control in its ultimate effect. Given the right tools and delicacy of touch, mechanical treatment in such cases is, on the whole, preferable, particularly if we have to deal with a carbonate surface which can be softened with acid as the work proceeds. In the second category we have cases where incrustations are stable and so characteristic of a certain class of antiquity as to make their retention desirable, as, for example, in the case of Chinese bronzes. These often have good smooth patinas of enamel-like quality which constitute the best form of protection and must accordingly be carefully preserved, even if local treatment should be necessary to arrest patches of active corrosion upon them. And, finally, there is the case of the incrustation which is so important in itself that it must not be destroyed. I refer in particular to the class of object excavated from a bog or lacustrine site which may contain the membranes of microscopic pollen-grains. When separated and examined by a specialist these are capable of affording evidence of age.

They provide data concerning the composition of post-glacial forests which have been subject to fundamental changes through the ages. The marshy ground has preserved the evidence of these changes in both animal and vegetable remains, and especially in pollen grains, so that a lake or bog can be calibrated in a series of zone levels which provide a natural time-scale for the antiquities found nearby. This kind of study, which is a comparatively modern development, is growing in importance with the accumulation of reliable reference data, and the danger of destroying irreplaceable evidence must never be forgotten by the conservator when he is faced with the task of conserving material from old lake deposits and the like in temperate regions.

METHODS OF CLEANING AND PRESERVATION

The cleaning and preservation of antiquities involves the application of certain chemical, electro-chemical and mechanical processes; methods are varied to the requirements of the individual metals and also to the great variety of objects which have to be dealt with. As full working details have already been made available elsewhere,[1] it will suffice perhaps for the present to refer in summary fashion to a few of the most useful processes.

Some description of each of these methods is required with reference to the particular metals with which we have to deal.

USE OF SOLVENTS

If visible evidence of antiquity is to be preserved whilst cleaning, mild alkalies are in general the safest agents to employ. In the case of bronze and base silver, soaking in repeated changes of a warm dilute solution of sodium sesquicarbonate followed by treatment with distilled water will eventually get rid of chlorides without destroying cuprite. Any red cuprite will become darker in colour it is true, but if the original green incrustation on a bronze is fairly uniform, the chances are that stabilization can be effected with little obvious change in appearance. The use of hot formic acid was referred to for removing tarnish from silver and in general any stains upon it that may be due to copper minerals. For incrustation on copper alloys, dilute citric acid is a mild and effective solvent; sulphuric acid reacts more violently with copper alloys and is of more restricted use. In using acids for cleaning

[1] H. J. Plenderleith, *The Preservation of Antiquities*. Oxford University Press.

antiquities it must be remembered that they are stripping agents, and that even in dilute solutions they are capable of removing all the patina from copper alloys. The progress of cleaning by solvents of whatever class must not be allowed to proceed too rapidly; several hours in solutions of suitable dilution is a reasonable time and the work must be kept under frequent observation.

CHEMICAL REDUCTION PROCESS

When corrosion is not too far advanced and a bright surface is required, it may be possible to reduce the incrustation back to metal by heating the corroded bronze in a caustic soda or acid solution in contact with metallic zinc or aluminium. Reduction processes involve the generation of hydrogen gas and so it is essential that the object under treatment should have a good metallic core, as otherwise there is a likelihood of its being mechanically disintegrated. When the incrustation is heavy or when calcareous matter is adhering firmly to copper alloys, a reduction with zinc and citric acid or zinc and dilute sulphuric acid is often found to be the most effective treatment.

For the treatment of a silver object that has been largely converted to chloride, the alkaline process of reduction is generally preferred. The silver obtained on reduction tends to be soft and granular in nature, but it hardens on drying and may eventually be burnished and lacquered after it has undergone thorough washing with distilled water. Modern silver which is badly tarnished may readily be cleaned by placing it in contact with aluminium in a solution of washing soda. The zinc and caustic soda process is used with iron objects, but with this variation, that it is as well to leave some alkali in the metal after the final washing as this tends to inhibit subsequent rusting.

USE OF THE ELECTRIC CURRENT

There are various methods of employing the electric current with a suitable electrolyte to clean corroded metal, and when due precautions are taken to ensure that electrolytic cleaning is continuously under control and not too violent in action, it possesses certain advantages. It is easy to operate and can be adapted for dealing with material in bulk.

In 1937 a hoard of sixteen thousand silver coins was found at Dorchester during building operations, and numbers of them were adhering together by their corrosion products. The separation and salvage of the individual coins by chemical methods would have been

very tedious and would probably have taken a year or more to carry out. Happily they were in a sufficiently solid condition to withstand electrolytic cleaning, and it was possible for my colleague, Captain A. Lovett-Cameron, to deal with the whole collection within a few months, the only complication being a tendency for the silver after cleaning to acquire a copper colour whilst it was being burnished, owing to traces of reduced copper being occasionally present; this difficulty was easily overcome by washing the coins with ammonia or dilute sulphuric acid.

Of the sixteen thousand coins only about a dozen were so badly eaten away that the inscription, etc., could not be recovered, and almost all of the remainder after cleaning were in such good condition that it was considered that they could never have been in actual circulation.[2]

Operational details are as follows: the object to be cleaned is made the cathode in an electrolyte of caustic soda (2 per cent. strength) using an iron anode and passing a current of about 4 amps. for the necessary time, i.e. until on removing and brushing the object it is found to be clean. The hydrogen evolved at the cathode gradually loosens any earthy accretions; the oxidized metal is reduced while chlorides are decomposed at the anode. The metal is then dipped in dilute sulphuric acid if necessary, washed in the usual manner with distilled water, dried and lacquered.

Heavily rusted iron objects which have still a good metallic core respond very well to such treatment, and greater current densities may be employed. Iron is finished with a soft scratch-brush, preferably on a power-driven buff, and then protected with a thin coat of vinyl acetate in toluene. Iron objects which are restored in this manner present, from the museum point of view, a more satisfactory appearance than when they are dealt with by the chemical action of phosphate solutions, as these tend to cause unnecessary etching and convey a dull black finish of uninteresting uniformity.

MECHANICAL TREATMENT

The use of power-driven brushes, dental equipment, small hammers and chisels, etc., is as a rule only permissible after the mineralized surface has been softened by the application of one or other of the chemical or electrochemical methods described. Mechanical

[2] Captain A. Lovett-Cameron, 'Cleaning a Hoard of Silver Coins', *Museums Journal*, vol. 37, p. 251.

processes are nevertheless an accessory to almost every restoration; they are used to open up incrusted surface deposits and allow reagents to get at the seat of active corrosion.

2. Structure of Patina

It has been stated that the fundamental factor in determining the structure of corrosion products is the alloy itself. The composition of the tin bronzes of antiquity varies considerably, covering the whole range of useful alloys from an impure copper with a negligible content of tin to the alloy known as speculum metal, which was used at one time for mirrors and may contain as much as 30 per cent. of tin. And the influence of additional minor constituents in determining the appearance of the surface must not be overlooked. Considerable variation in the structure of the patina of bronzes is therefore to be expected.

To determine what features are common to all bronze patinas which have formed naturally over a long period of time, one cannot do better than choose for study a bronze of intermediate composition, containing tin in quantities of, say 10 to 15 per cent.

One variety of incrustation characteristic of such alloys is the so-called 'warty patina', a nodular formation which may be stable under museum conditions but is liable to break out and become 'malignant' under conditions of high humidity, and when this happens the object exhibits all the characteristics of the 'bronze disease'.

If one of the nodules is chipped from such an incrustation and cut in sections, a structure is revealed which throws considerable light on the physical mechanism of long-term corrosion. It shows quite a series of parallel strata of cuprite and of stannic oxide indicating reactions which have been periodic and of diminishing intensity. The cuprite layers which are nearest to the surface contain cuprous chloride. If the section is placed in a damp chamber, corrosion becomes visibly active in the course of a few hours, and along the contours of the brownish-red layers of cuprite is traced a light green powdery efflorescence of basic chlorides. When tin is released from the alloy it is oxidized and it does not appear to play any significant chemical role in carrying chlorine to that part of the bronze which is as yet unattacked. It forms, however, a powdery and absorbent stratum which accumulates soluble by-products, and eventually sufficient chloride to cause a further outbreak of corrosion on the surface of the bronze that it is covering, and as there is less salt available for reaction at this new surface of attack than originally, the reaction is of less intensity than

before, and it is naturally extended over a rather wider area. Repetition of this chain of events broadens the base of the pyramid, the layers of cuprite and stannic oxide becoming thinner and thinner, and, eventually, at the base of the nodule, losing their individuality in the oxidized mass. The swelling accompanying oxidation is considerable and the strain on the surface often causes it to crack. The surface of the pyramid consists of cuprite usually covered by a dense green coating of malachite.

With the general structure of ' warty patina ' in mind, it is interesting to examine the phenomenon in alloys of varying tin content and observe how composition affects the physical constitution of the nodule.

On the polished side of a speculum mirror, for example, a characteristic and not infrequent feature is the occurrence of a group of nodules, and impaled, as it were, on the point of each nodule is a tiny fragment broken from the original polished surface, apparently itself quite unaffected chemically. This condition is to be explained by the fact of the greater brittleness of the speculum alloy coupled with the resistance of the highly polished surface to corrosion, the saline infection having taken place originally by way of a micro-crack, such as can be observed by examination through a polarizing microscope, which distinguishes the colours of the corrosion products filling the crack. This nodular pitting found on speculum metal is more isolated than the ' warty patina ' of bronzes of an intermediate class.

At the other end of the series, in alloys of less tin content, while there is sometimes evidence of the coalescence of a series of nodules, it is difficult to locate isolated seats of infection conforming to the structure of ' warty patina ', and it may be inferred that corrosion is more general in its attack along the surface of alloys of small tin-content. The banded structure in mineralized tin bronzes of low tin-content may be very simple as compared with that of the corresponding alloys of high tin-content, and the few strata which are present may be proportionately thicker.

In the case of some heavily corroded bronze bowls from Ur of the Chaldees, having a tin-content as low as about 5 per cent., the stratification was found to be of the simplest. The surface of carbonates was firmly attached to cuprite and when chipped off these two layers came away as one, revealing a white internal layer, which constituted the middle layer of the wall of the vessel and consisted of oxide of tin. There were thus only five distinct layers (two external green layers, two underlying red layers and one internal white layer) in a thickness of $\frac{1}{16}$th of an inch, and corrosion had proceeded to the limit.

A banded structure is a general characteristic of prolonged corrosion where alloys are concerned, and even pure metals exhibit something of the same kind in the gradation of their mineral deposits.

A section through a bead of base silver of about 2500 B.C. shows the variable stratification that might be expected when copper is the minor constituent, and horn silver the principal mineral of the incrustation.

In less corroded silver it may be shown that localized pitting represents a characteristic type of attack. This is of microscopic character and consists in the formation of tiny craters which are filled with horn silver.

In such studies it is unsafe to generalize. One attempts to correlate the observed phenomena bearing in mind that they are subject to variation by a large number of factors, several of which may be operating at the same time—imperfect mixing of metallic constituents, variation in chemical nature of attacking agents over varying periods of time during the life history of the object, and variations of the intensity of attack on different parts of the object.

Without attempting to reconstruct the chemical history of an incrustation or to determine its minor constituents in any great detail, a comparative study of patinas in the way that has been outlined is of great practical importance when it comes to the examination of alleged metal antiquities of doubtful origin.

3. Evidence of Antiquity

In studying antiquities it has been stated that examination has to be non-destructive, and the methods employed are therefore almost entirely physical in character.

After the general examination comes a detailed examination with a lens by daylight and also by ultra-violet radiation, should the subject seem a promising one. Certain features may then be selected for further study.

Low magnification may be used for revealing details of patina and magnifications up to about X100 with polarized light or ultra-violet light for more precise observations—for example, to reveal the contents of cracks or flaws in a casting.

Chemical spot-tests may be made or perhaps a spectrographic examination, if it is desired to verify that the patina is derived from the metal and has not been added by a restorer in preparing the object for a gullible purchaser.

When a shiny metallic surface is exposed, as it often is under the base or foot-rim, the stratification of the patina is revealed around its edges and may in itself be convincing enough in appearance; the exposed metal may be polished and, if necessary, etched, and examined for structure and particularly for inter-crystalline corrosion. Structure may be apparent without etching. In this examination island pockets of cuprite may be found which date back to the time when the metal was cast and are not necessarily indications of age. It is the oxidation on the boundaries of the crystals starting from the edge of the bronze beneath the cuprite and penetrating into the metal that is of value as evidence of antiquity. Inter-crystalline particles of almost pure copper may also be found which have been deposited as a result of secondary reactions during corrosion, and these also are evidence of considerable age.

Sometimes X-ray methods may help to elucidate matters. Powder photography is the method best adapted to identify any doubtful mineral constituent, if there is some indication as to what its character may be. An ordinary radiograph reveals cracks and has often helped to distinguish make-up by the difference in the penetration of the rays on the different materials constituting the object.

A few clinical examples selected to show the results of different tests on bronze and silver may not be without interest.

EXAMPLES

1. A rather good Egyptian bronze Shawabti figure of 18th Dynasty style, apparently quite sound, was shown by its localized fluorescence in ultra-violet radiation to have been made up by soldering the head and shoulders of one statuette to the body and legs of another, all parts being genuinely ancient except the soft solder and a mixture of hard wax and cuprite that was used to conceal the joint.

2. A Chinese bronze casket of the Shang-yin period (? 1766–? 1122 B.C.) was on all counts a genuine piece and at first gave no apparent fluorescence by ultra-violet light. But a closer study with the Ultrapak microscope revealed a tiny area of unstained yellow clay beneath some of the green patina, which was regarded as suspicious, and near this spot, beneath the patina, was discovered soft solder.

Prolonged examination revealed that a large triangular area had been broken from the much oxidized metal and very skilfully repaired by tacking with solder and then by making a corroded joint over which was a deposit of clay and malachite. The repair was later found to be

faintly visible under the ultra-violet lantern when one knew where to look for it and after sensitizing the eyes in a dark room for some time.

3. A peculiar little bronze griffon of unusual style was regarded with a certain coldness, but a clever repair having been discovered in the body, it was argued that this indicated probable genuineness. An X-ray examination drew attention to the fact that one leg was of different metal to the main part of the bronze ! Examination of a scratch made with a needle on what was estimated to be the junction of the two metals revealed that the leg was, in fact, an artificial limb of modern bronze, artificially patinated with cuprite and malachite by using an adhesive, the nature of which could not be determined by non-destructive methods. It was decided that the griffon was an undoubted antiquity in badly mutilated condition, possibly damaged during excavation, and that it had fallen into the hands of someone who had throught it worth while to try and restore it to what presumably was a semblance of its appearance before dismemberment.

4. The falsity of an inscription was confirmed in the case of a fine Chinese bronze vessel by the discovery that the patina covering it was soluble in toluene ! On removing mud and a green deposit from the hollows of one of the characters and studying this under the microscope, it was found to have been cut into the metal with a chisel, whereas an inscription in a bronze of this kind is invariably traced in the wax model before *cire perdue* casting.

In another case a suspected false inscription was exposed as counterfeit by the discovery that a certain bronze had a false bottom bearing the inscription. The metal, which was not old, had been corroded into position above the genuine base.

5. It is seldom that one has the satisfaction of obtaining outside confirmatory evidence after an object has been condemned as a forgery, but this happened in the case of a silver plate purporting to be of Bactrian origin (i.e. dating to about the third century B.C.).

The plate, which was a heavy casting in fairly pure uncorroded silver, bore ornament in relief taking the form of a lion and bull motif with a running deer in the background. Microscopic studies formed the basis of the examination in this case. A thin film of sand and carbonate of lime adhered to the back of the plate and the underlying metal was scored but not greatly tarnished. A modern scratch on the edge of the plate revealed that the metal was not in a brittle crystalline condition, and this was borne out by the microscopic examination of tiny dents in the rim. Blow-holes in the metal under the base did not

contain horn silver or indeed any appreciable amount of corroded matter. A report was therefore prepared condemning the plate as a forgery, with the qualifying statement that the design was so convincing in character that it might have been copied from some genuine object. The ornament is rather reminiscent of that occasionally found on Sassanian silver (A.D. 211–651) from Persia. About a year later a Persian archaeologist discovered two fourteenth-century manuscripts in the Yildiz Library at Istanbul showing on one the fight between the lion and bull and on another the running deer, and these designs had been copied with the greatest precision by the forger responsible for the plate.

These examples must suffice to illustrate how antiquities can be assessed by the scientific examination of details.

Much has already been accomplished by such studies, but, as I have pointed out elsewhere, one must be ever on one's guard against reading too much into purely qualitative evidence and it is, in fact, the case that the answers to some of the simplest archaeological questions are still beyond us.[3] We cannot tell, as far as I am aware, by any non-destructive test whether a silver coin has been cast or struck unless it exhibits some illuminating flaw in manufacture.

We can say that a metal is ancient, but not how ancient. We cannot so far determine by scientific means whether a Chinese bronze is of Shang or Sung dynasty, whether, that is to say, it is 3000 or only 1000 years old, and this is an important matter in Chinese archaeology. One can only hope that in the course of time the accumulation of data, chemical, physical and metallurgical, will contribute somehow to the formation of a criterion.

There are many aspects of activities in a museum laboratory, and I trust that some of those relating to metals and corrosion have not proved uninteresting.

[3] H. J. Plenderleith, 'Technical Notes on Chinese Bronzes', *J. Oriental Ceramic Society*, 1939, pp. 33–55.

The Chank Shell Cult of India

by James Hornell

THE cult which is the subject of this paper centres round that magnificent snow-white gastropod shell called Chank by Europeans, *sangu* by the Tamil divers who fish it in the Gulf of Mannar, and *sankha* by the people of Aryan speech in the north of India. To zoologists it is known as *Xancus pyrum* (L.), a name which replaces the former ones of *Turbinella pyrum* and *T. rapa*. It is strangely local in distribution ; its main habitat is the sands between and around the rock-strewn pearl-banks of the Gulf of Mannar ; here it thrives best, is most abundant, and grows to the largest size and most symmetric shape (fig. 1). Another centre where the same form is found is the northwest coast of Kathiawar but here its numbers are relatively few. A somewhat stunted variety or sub-species exists in Palk Bay and Strait and along the Coromandel Coast, with another in the Cape Comorin region, while one, sufficiently distinct to be given specific rank, occurs in the Andaman Islands. Nowhere outside of India is the chank found ; neither in the Persian Gulf and the Red Sea, nor in Malayan and Australian waters does any closely related species occur.

The chank is gregarious ; its haunts form distinct beds on sandy bottom where tube-worms abound ; these constitute its favourite food. The shells are fished by local divers working ' naked '. Annually from two to three millions are obtained in the coastal waters of India and Ceylon. All are bought by merchants who come from Bengal. The great majority are converted into ornamental bangles in small factories located in Dacca, Calcutta and a few less important centres, all situated in Bengal. In ancient times, dating even from the pre-historic period in India, shell-cutting workshops were to be found throughout the Peninsula—from Kathiawar in the northwest, through the Deccan down to the southermost end of the land. From this and other evidence it is certain that in pre-Muhammadan days chank bangles were worn by women in every province of India. Today the custom is confined almost entirely to Bengal and the neighbouring hill districts, with an extension into Tibet and Assam, with the factories

restricted strictly to Bengal. Apart from bangles, the shell is used for many other purposes. The largest and most perfect are reserved for religious purposes, serving either as libation vessels wherewith to lave the images of the gods with holy water, or as trumpets to call the god's attention to his worshippers' supplications; the smaller commonly serve as feeding spouts for babies, and as amulets, with the waste converted into finger-rings and beads.

Of these uses, those of religious significance possess the greatest interest. When and how the cult of the chank as a religious symbol originated are questions going back so far beyond any traditions now existing that the utmost difficulty confronts us when we seek to find the solution. One main fact alone seems certain—the non-Aryan origin of the symbol. The Aryan-speaking hordes which descended upon the Punjab through the northwest passes, perhaps 2000 years B.C., certainly did not bring the custom with them. They, the warrior herdsmen of the plains of eastern Europe and western Asia, had never seen the ocean; they knew not as yet the deep, sonorous boom of the snow-white chank—a note on a curved cattle-horn was with them the signal between scattered bands, while their hymns tell us that in music they used the drum, the flute and the lute. Vishnu, the God whose emblems include the chank, is barely mentioned in the Rig-Veda and the few Vedic hymns to him were probably composed after long intercourse had been established with the Dravidians, the chief race whom the invaders found in possession of the new land. He is certainly one of the gods borrowed from the pantheon of the indigenous people, for his complexion is characteristically represented as dark-hued whenever his image is shown in colour.

The key to the origin of the cult is, I believe, to be found in the custom prevalent among animists of employing noise to scare away the demons whom they fear. At the present day Bengali Hindus make a practice of sounding the shell-trumpet which many households keep for religious rites, whenever an eclipse or an earthquake occurs. Clearly this is a survival of the use of loud blasts on a shell to scare away evil spirits—the demon intent on devouring the moon or the sun, or shaking in fury the foundations of the world. This custom at once conferred religious significance upon the object whose noise frightens away the evil spirit and restores peace; the shell in consequence was honoured and held sacred. Probably it was associated with one particular god, the prototype of Vishnu, and, with his adoption into the Aryan Pantheon, his emblem and weapon against the powers of evil would accompany

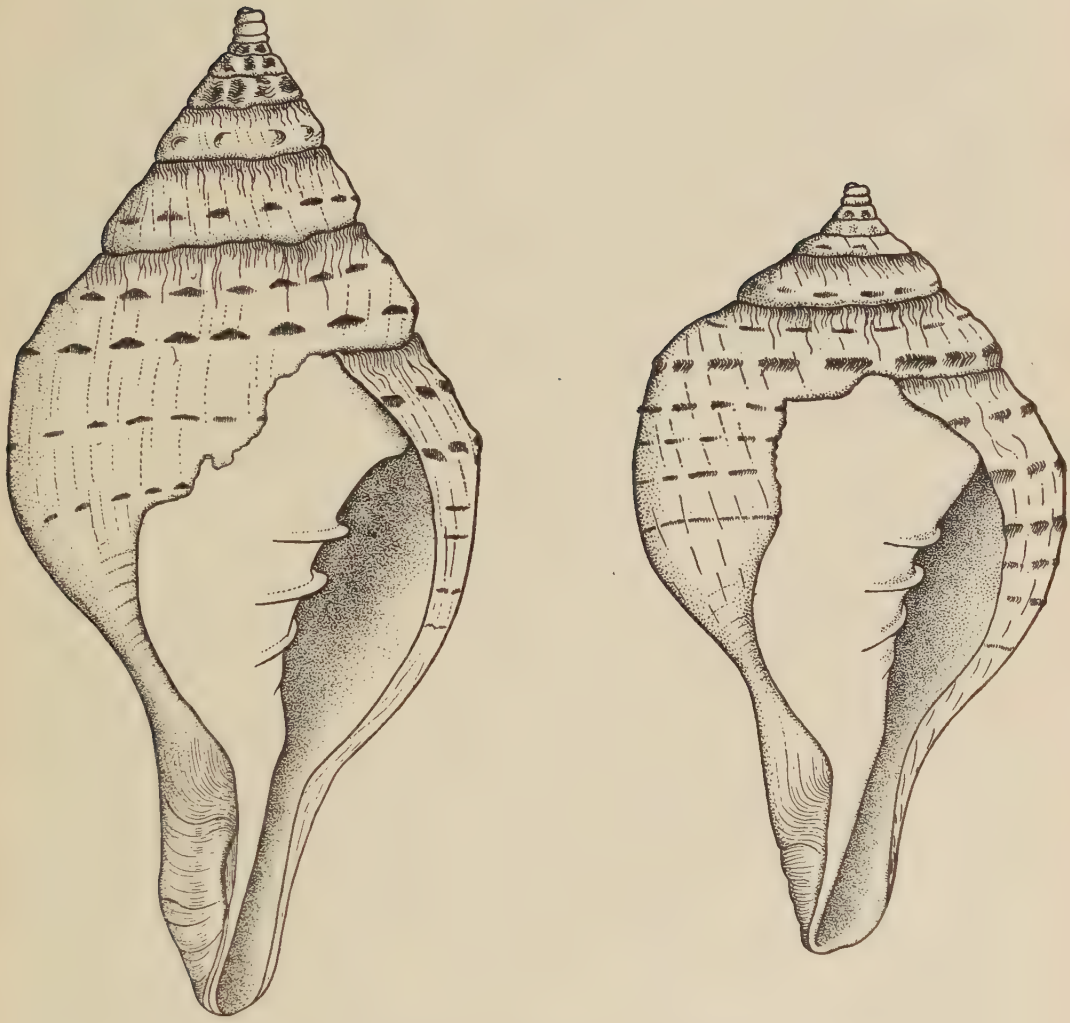

FIG. 1. TWO FORMS OF THE INDIAN CHANK (*Xancus pyrum*, L.)
ONE ELONGATED, THE OTHER SHORT AND SQUAT

him and become endowed with still greater and deeper religious significance.

The earliest literary notices of the use of the chank are, however, of a secular nature and occur in the two great Indian Epics, the Mahabharata and the Ramayana. In these we find frequent reference to the employment of the chank as a martial trumpet by the great warriors whose more or less mythical exploits are recounted. Particularly is this the case in the Mahabharata where, in the Bhagavat-Gita (verses 11 to 19), we find the heroes bidding defiance to their foes and endeavouring to terrify them with loud blasts on their battle-conchs, even as their forefathers scared away the evil-working spirits of the village. Each hero had his famous conch distinguished by some high-sounding name, just as the famous swords of European legendary heroes were frequently given names that have become immortal in song and story. The beautiful Excalibur wielded by Arthur in many glorious fights, Charlemagne's famous Joyeuse, and the magic Tyrfing so oft a theme of Viking sagas, have their parallels in the names of the shell-trumpets of the Mahabharata heroes.

Here, too, we hear for the first time the name Panchajanya given to the conch of Krishna, king of the Yadavas, who had espoused the Pandavan cause. Around this famous shell many legends have gathered and now we see it held on high in all figures of Vishnu, who is considered to have been re-incarnated in Krishna. According to one legend, Panchajanya was originally the shell home of a terrible marine demon, Panchajana, who lived on the sea bottom. At last he filled the measure of his misdeeds by seizing the son of Sandipani, who had taught Krishna the use of arms. The god, fearless of the consequences, rushed to the help of the child, assuming the form of a fish ; after a fierce struggle he vanquished the demon and brought away his shell as a trophy, since accounted one of the emblems of Vishnu and Krishna.

Always is the chank shell of these gods represented as a sinistral abnormality in which the whorls turn counter-clockwise, and legend pictures to the mind of the devout Hindu every shell of this rare form when alive as a marvellous production, receiving the homage of thousands of chanks of the ordinary form which, they believe, crowd around it on all sides. No more fitting gift to a deity can be imagined by the pious Hindu ; as the symbol of the god who in practice divides with Siva the worship of the Hindu world, as a production of Nature so scarce as to appear once only in several millions of normally shaped

shells and as an emblem of purity, could worshipper find more fitting offering at the shrine of the god ? Thus it is that the pious wealthy have dedicated these shells from time to time to favourite temples—particularly to those held in high esteem at centres of Hindu pilgrimage (PLATE I, p. 120).

That this custom has not originated with modern Hinduism is indicated by the fact that sinistral chanks are objects of adoration among northern Buddhists. Sarat Chandra Das, the intrepid survey officer who spent some perilous years in Tibet, mentions that at the Sakya Monastery lying to the southwest of Shigatze, there is preserved a chank of this rare form. Its history is invested with more than ordinary interest for the monastic records state that it was a present from Kublai Khan, the great Mongol conqueror of China, to Phagpa, a hierarch of Sakya, whom Kublai made ruler of Tibet in the second half of the 13th century. This famous shell is blown by the lamas only when the request is accompanied by the present of seven ounces of silver, but to have it blown ' is held to be an act of great merit '.

At one time the value of these abnormal shells is said to have been assessed at their weight in gold and this statement is probably correct. Today they are much less valuable and small or imperfect ones occasionally change hands in the north of Ceylon at from £4 to £5 each ; such shells are usually sub-fossil ones found buried in deep mud. Large and good-conditioned shells obtained alive, and therefore of good colour, still command high rates—anything from £30 to £370 or more—so infrequently are they found.

Among the ignorant lower castes who usually have never even seen a sinistral chank—called by them a *Valampuri* chank—the belief is prevalent in Tamil South India that it blows of its own accord during the night ; even the Roman Catholic chank divers of Tuticorin entertain this quaint superstition, and say that the shell is specially clamorous on Tuesday and Friday nights ! A yogi when controlling or retaining his breath is also credited with hearing the sound of a Valampuri chank blowing within his abdomen, though why the rumbling should be that of a Valampuri and not of an ordinary chank would be hard to answer.

Worship of the chank as one of the essential articles required in domestic worship among Brahmans should occupy an important part in the daily liturgy of the priestly caste, and in the Brahma Karma, the work which sets forth in minute detail the order and phrasing of the sacred rites of the Brahmans, the prayer to the sacred chank is given as follows :—

> Taking the chank in his hand the Brahman recites : At the mouth of this shell is the God of the Moon, on its side is Varuna, on its back Prajapati and on the apex the Ganges, the Saraswati and all the other sacred rivers of the three worlds in which they make ablutions according to the commands of Vasudeva. In this chank is the chief of the Brahmans. This is why we must worship the sacred chank. Glory to thee, sacred shell, blessed by all the gods, born in the sea, and formerly held by Vishnu in his hand. We adore the sacred chank and meditate upon it. May we be filled with joy ' !

This prayer is now seldom used ; on specially important holy days a curtailed version runs thus :—' Oh, chank shell, thou wast produced in the sea and art held by Vishnu in his hand. Thou art worshipped by all the gods. Receive my homage '.

Sinistral chanks, whenever possessed by a temple, are usually mounted in handsomely ornamented golden settings and used as libation vessels in the service of the god. Whether the god be Siva in the form of a lingam or Vishnu or other deity represented in anthropomorphic shape, the officiating priests must lave it with water rendered holy by being poured from the mouth of a chank. On certain auspicious days cow's milk is used for the libations in lieu of water. And if the doubly sacred sinistral chank is not possessed by the temple, then a choice example, without blemish, of the ordinary form must be employed.

An interesting fact about the sinistral variety of the chank shell is that on the fishing grounds in South Indian waters, the great majority are fished in one restricted locality, indicating that there is in this particular place a family (using the word in the limited popular sense and not in the zoological meaning) distinguished by this peculiarity, just as there are occasional families among men where six fingers are commonly inherited instead of the normal five.

In Tibet the call of the chank is amongst the most familiar sounds to be heard in the monasteries and temples of the Lamaistic faith. Besides its use in religious ceremonial, the chank trumpet is blown on many secular occasions. Tea-drinking among the Lamas must never be missed ; the monks partake of it even in the midst of the most important ceremonies, and, to prevent the terrible misfortune of a brother being too late for any distribution of tea, the departure of the novices from the kitchen, bearing their loads of hot tea in large copper vessels upon their shoulders, is signalled to all in the various halls and cells by a loud call upon a chank-horn sounded from the temple roof.

Sven Hedin also describes a cave inhabited by a hermit reputed to be one hundred years old, who passed his days crouching in a niche in

the temple wall continually saying prayers and occasionally blowing a faint blast on a chank. And when a monk, no longer able to answer the shell's call to gather with his brethren round the tea coppers and bowls of tsamba, passes quietly away, the same sound summons those who remain to attend his funeral mass.

Whenever a new Hindu temple is built or when a new shrine or god is established and added to the number already there, the dedicatory ceremonies include, as one of the most important, a special libation to the god from the mouths of 108 chanks, or better still from those of 1008 chanks if so many can be afforded, filled with water and flowers. The building of an ordinary private house in the Tamil country must also have its ceremonial dedication at the time that the foundations are dug, though among low caste people the rite consists merely of a superstitious act intended to ensure good luck or to baulk the evil eye. Before a single stone of the foundation is laid, the ceremony is carried out on a day carefully chosen as being highly auspicious. A chank shell is then buried beneath the first stone laid. Even Roman Catholic converts from low castes follow this custom ; the carpenter employed having fixed upon a fortunate date, a chank is bought in the bazaar and the foundation trench dug ; in this, upon a prepared bed of coral stone and mortar, the chank is laid. In the mouth-cavity of the shell small fragments of the five metals, gold, silver, copper, iron and lead are deposited, tumeric and sandalwood water are sprinkled over and the whole hidden under a mass of sweet-smelling flowers. The ceremony ended, a covering stone may now be lowered into place upon the chank and its contents ; good luck is believed to be assured thenceforward to him who shall inhabit the house when completed.

Sometimes a chank shell is embedded in a shallow hollow in the floor of the entrance hall of a house a little on the inner side of the door opening upon the street. A small patch of white on the floor indicates where the shell lies. In this position, whenever an inmate leaves the house, he must pass over it, usually touching it with his foot ; this is considered to ensure that misfortune shall not happen to him while away from home.

The chank trumpet has important but variable functions to perform at weddings among all Hindu non-Brahman castes in the districts of South India ; on such occasions the shell is blown by the barber at or immediately after the tying of the *tali* or marriage badge around the bride's neck ; the bridal couple usually occupy a raised platform and round and round this the barber walks while blowing his chank. In

Bengal this custom of chank-blowing is even more general ; a common formula which may be translated—

' May Ganges water and sea-chank betide
Enduring bliss to bridegroom and bride ',

is usually recited during the marriage with reference to the frequent blasts on the chank which accompany the ceremonies—the equivalent of the marriage bells in Christian ritual.

Curiously enough chank-blowing at weddings is not used by any caste in Telugu districts as there this is considered to be inauspicious because chank-blowing is specially associated with funeral ceremonies.

Still another important use to which the chank is put is as an amulet against the evil-eye. Belief in the reality of the malign results which ensue from being ' overlooked ' by a person endowed with the power of the evil-eye is frequently present in an acute form in the Madras Presidency. It is especially dreaded in the case of houses under construction and in respect to valued cattle. Everywhere in Tamil districts the custom prevails, more or less extensively, of seeking protection for draught bullocks by tying a small chank shell upon the forehead of such as are in good condition, or in any way specially valuable or beautiful in their owner's eyes. In Madras city it is quite common to see it so used, and there also I have seen a shell hung by a chain or a cord round the neck of a cow-buffalo when in milk to prevent her being overlooked and her milk thereby dried up prematurely. In Madura highly prized sheep are occasionally guarded from evil in the same way and here too I have seen milch-goats protected in a like manner.

The Roman Catholic fisher-folk of Tuticorin and other Parawa coast villages are also great believers in the virtue of chank amulets and till recently all babies were given bangles cut out of chank shell to protect them from convulsions and a disease which is probably rickets. Even now the poorer and more ignorant continue to employ these amulets, keeping them on the wrists of their babies for about three years.

In other districts, in addition to chank bangles and rings, very roughly fashioned fragments of chank shell, imperfectly rounded, are used in the manner of beads to make necklaces as amulets ; people of some castes or tribes often give their children both chank bangles and chank necklaces with a view to multiplying the countervailing influences against the evil eye and disease.

The rough beads used in making necklaces look very like tiny

PLATE I

SINISTRAL CHANK USED IN WORSHIP IN THE SATYA BHAMAJI TEMPLE, BET, KATHIAWAR

facing p. 120

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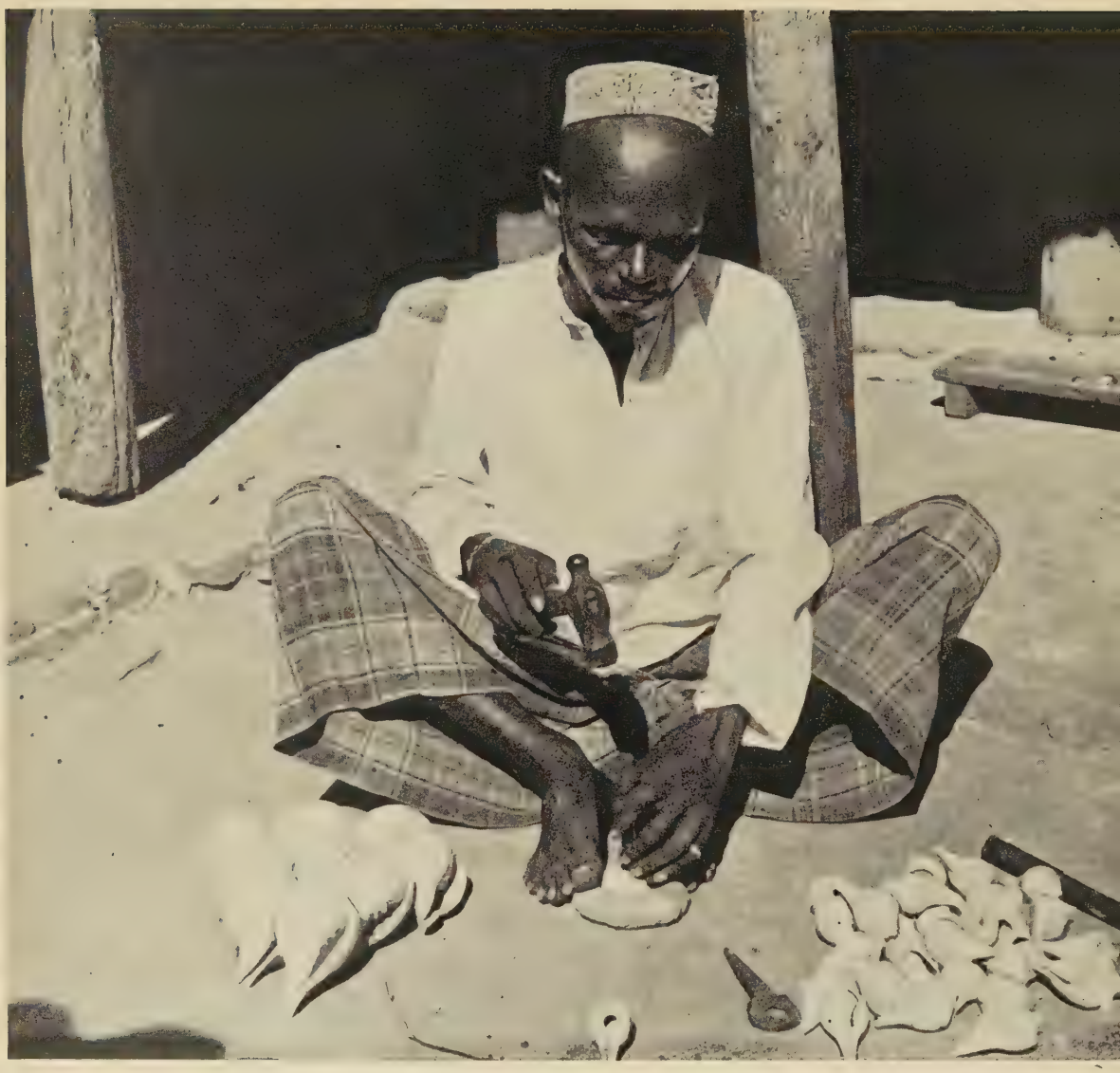
(1) SINISTRAL CHANK FROM THE SHANK NARAYAN TEMPLE, BÊT, KATHIAWAR
(2) SINISTRAL CHANK, USED IN WORSHIP IN THE LAKSHMI TEMPLE, BÊT, KATHIAWAR
(3) SECTIONING A CHANK SHELL IN A DACCA WORKSHOP

1. RUBBING DOWN THE INNER SURFACE OF A CHANK WORKING SECTION, DINAJPUR, BENGAL

2. SETTING AN ENGRAVING SAW, DINAJPUR, BENGAL
Phs. J. Hornell



MAKING CHILDREN'S FEEDING SPOUTS FROM CHANK SHELLS, KARIMANAL, NEAR PULICAT, MADRAS
Ph. J. Hornell

carpal bones ; they sell at extremely low prices—often eight beads may be had for one pie, the twelfth part of one penny, and a whole necklace may therefore be bought for the equivalent of a penny ; the small bangles worn by babies cost from three to four pence a pair. The majority are cut from undersized shells too small to have value in the Bengal market.

Discs cut from chank shells are also in use in Tibet and the Abor and Naga districts of Assam. In 1666 when Tavernier was in Dacca, he notes the fact that Bhutan merchants took home quantities of ' round and square pieces of shell of the size of our 15 sol coins '. He adds that ' all the people of the north, men, women, girls and boys, suspend small pieces of shell both round and square from their hair and ears '.

The Nagas employ similar discs both to form necklaces and to decorate the handsome plaited cane helmets worn by the men. These latter are conical in shape, about a foot high, covered with a layer of fur or hair, black or red in colour. When decorated with chank shell discs, these are arranged as coronals. During the Abor expedition early in this century, an officer with the British forces informs me that the Naga coolies employed as carriers often wore necklaces formed of square concave portions of chank shell with a large cornelian set *en cabochon* at the centre. Sometimes long cylindrical chank beads, tapered slightly at either end, were used instead ; cornelian beads were often seen intercalated. So valued by the Nagas was the chank in former times that up to less than a century ago, chank shells constituted the currency of these tribes, but with the advent of the rupee, the consideration in which these shells were held largely disappeared. While the chank currency lasted, the shells had a properly defined exchange value. Slaves and cattle in particular were always valued in chank shells. Thus while a male slave was worth one cow and three chank shells, a female slave, much more valuable in the estimation of these wild people, was worth three cows and four or five chank shells. It appears that a cow was valued at ten chank shells, a pig at two shells and a goat at the same rate ; a fowl was worth only one packet of salt. As a chank was considered worth one rupee, a short calculation will show that a male slave was worth Rs. 13, say £1, and a female slave 34 shells or Rs. 34, or £2 10s. On one of the early British expeditions into the Naga country, the chief of one village proudly told the British commander that ' since we became British subjects we have paid revenue in coin and with it we can procure anything we require ; we no longer want shells and beads '.

The finest chank shell discs that I have seen are prehistoric in age, having been taken from very peculiar oblong sarcophagi, made of red pottery and raised on 6 or 8 stumpy legs, found in ancient graves at Perambair in Chingleput district, Madras. These range from $2\frac{1}{2}$ to 3 inches in diameter ; in both the examples in the Madras Museum there is a small central perforation. The convex surface in each is ornamented with handsome geometrical patterns of much delicacy. The shape and size of these ornaments suggest that they were used as boss ornaments for the back hair in the manner of the gold or gilt discs affected by native women of certain castes in South India. Actually the custom still survives in Travancore where, when the wearers cannot afford gold, these boss ornaments may be made from chank-shell, ivory, bone or even coconut-shell.

The industry dependent upon the fashion of wearing chank bangles which is prevalent among the women of Bengal and to a less extent elsewhere in India, deserves special attention, for the methods employed remain as primitive as they were many hundreds of years ago ; the waste material from the workshops today is identical in every respect with that found on prehistoric factory sites.

Other uses of the shell are extremely numerous but they all have insignificant commercial importance, whereas the fishing of chanks for the bangle trade, the cutting, carving and lacquering of the sections sawn from these, and the distribution of the finished articles, employ some thousands of people—divers, workpeople and traders.

The Bengal bangle trade is estimated to consume an average of $2\frac{1}{2}$ million chank shells annually and the final retail value of this industry at a conservative estimate is considerably over £100,000.

In Bengal every married woman of all castes which are thoroughly Hinduised is bound to possess a pair of chank bangles, lacquered in vermilion, as one of the visible tokens of her married state ; the red sankha is indeed as necessary of assumption during the marriage ceremonies as is the performance of that other Hindu custom of smearing a streak of vermilion on the forehead, or down the parting of the bride's hair or as the wedding ring of European women (FIG. 2).

Besides these special bangles vast numbers of uncoloured ones are used for purely personal adornment. These are always ornamented with carved and polished patterns. Some are exquisitely engraved and occasionally may even be set with precious stones. These ornamented bangles fall into two classes, the *bala* and the *churi*. The bala are broad and are worn one on each wrist. The churi on the contrary

are always narrow, generally about one-fifth of an inch in width, worn in a set of three on each wrist (FIG. 3).

Among Bengal castes of inferior social status, and among tribes whose physical characteristics bespeak non-Aryan descent, the use of chank bangles made up into massive gauntlets, composed of numerous separate bangles, is very prevalent (FIG. 4). Many of these people are now, or were till comparatively recently, followers of animistic rites, and this gives colour to the belief that the chank cult was solidly established

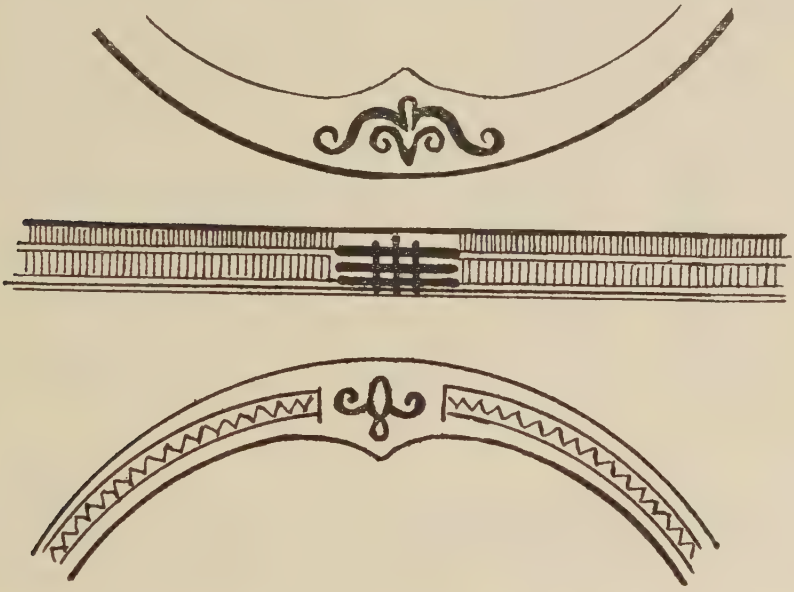


FIG. 2. ORNAMENTATION OF A LACQUERED MARRIAGE BANGLE, BENGAL

among the aboriginal tribes of India before the advent of the Aryan invaders and the rise of the Brahmanic faith, which, however, adopted and modified the cult, much as certain religious customs in Christian Europe were adopted from antecedent creeds.

A broad shell-bracelet, in shape like a cuff, is worn very generally throughout Tibet. This ornament is assumed early in life while the hand is still small and pliable ; after a few years it becomes impossible of removal without breaking it, which these women will suffer only in the last resort, for it cannot be replaced except by one of large diameter which will fit more loosely on the arm than they consider proper.

The stages through which a chank shell has to pass before becoming converted into a number of bangles are many and interesting. The preparation of working sections is carried out in shady sheds in the backyards of the employers. The shell has first to undergo a preliminary treatment to free it of the central column or columella. To admit of this a slice of the wide lip is first sawn off; it is then easy to break through and shatter the spiral septum connecting the columella with the walls of the shell. The apex of the shell is next smashed in, releasing the columella.

The shell is now ready for the sawyer, who sits on the earthen floor, tightly wedged between two short stakes of unequal length driven into the ground. Against the longer the worker's back is supported whilst against the shorter his toes are pressed. The saw used is of an unusual pattern; the iron blade is of a deep crescentic form with a long vertical tang at each end. A bamboo rod connects the upper ends of the tangs. Before beginning work the shell is placed obliquely between the feet; balancing the saw carefully, the sawyer applies the toothed edge to the shell and begins a rapid to and fro rocking movement of the saw from side to side, the course of his hands being through an arc of a circle at each swing (PLATE II, FIG. 1). On an average it takes $4\frac{1}{2}$ minutes to saw once through a shell. Of the narrow *churi* bangles as many as ten working sections may be obtained from a good-sized shell, but of the broad *bala* bangle three are a good average.

The further stages in the manufacture of chank bangles vary within wide limits, dependent upon the market to be served. The first stage in all is to remove the inwardly projecting beak, which is the remnant of the septum between adjacent whorls of the shell. This has to be chipped off with the utmost care to prevent fracture of the ring. Next, the inner surface is rubbed down by threading several sections on a wooden spindle about 18 inches long, covered with an abrasive coating of fine river-sand embedded in a basis of rough lac, and working the sections up and down till the required effect is obtained.

Highly finished bangles necessitate ornamentation by means of carving, drilling, polishing and lacquering. For carving, small tenon saws and files are used; preference is given to the saw whenever possible as it is flexible and more expeditious than the file (PLATE II, FIG. 2). The greater part of patterns composed of straight lines and grooves is graved by the saw. An ornamentation frequent on cheap bangles is a V-shaped groove passing circumferentially around it. This is effected by two cuts made by the saw and finished off by filing.

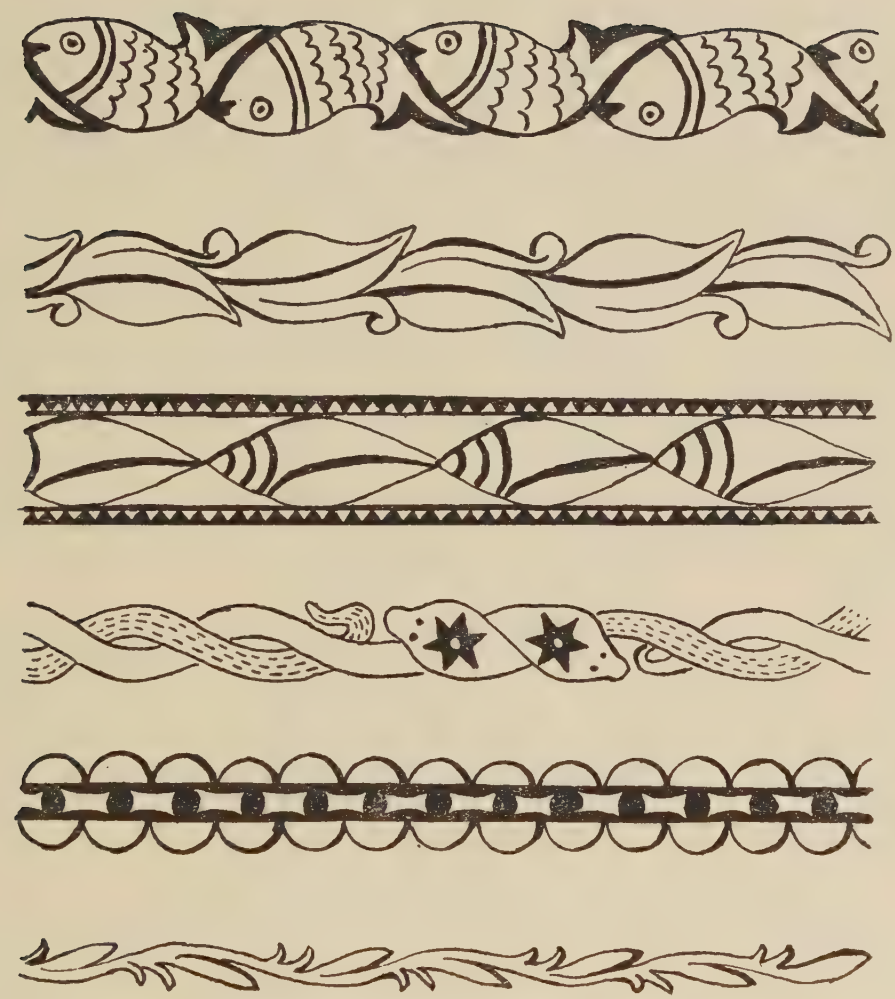


Fig. 3. SOME CURRENT CHANK-BANGLE PATTERNS IN USE IN BENGAL

Owing to the custom prevailing in Bengal among Hindus which requires a bride to put on two red-lacquered bangles, a considerable industry exists in lacquering bangles. The preparation of the coloured lac is done by the workpeople themselves, by mixing one part of cinnabar, ground fine, with three parts of common bazaar lac, made plastic by heat. The softened mass is twisted about over a charcoal fire and repeatedly wound from the end of one stick to that of a second till incorporation is complete.

In the actual lacquering of a bangle, a short segment of the circle is heated over a charcoal fire, a portion of the ring of shell being laid directly upon the glowing lumps of charcoal. As soon as the bangle section is heated sufficiently, the workman removes it and rubs the warmed portion with the end of a thin stick of lac. A short length only is covered at each application as the bangle soon becomes too cool to melt the lac; the operation has therefore to be repeated time and again until the whole circumference has been worked over. In incised patterns required to stand out in red upon a white ground, this effect is obtained by scraping over the surface with a small tool shaped like a bradawl.

Of late years several of the more enterprising of the bangle manufacturers have broken with ancient tradition and have employed European *motifs* in the designs of the more expensive classes of bangles, with the idea of extending their sales to European ladies. Some have even sent consignments to London agents with a view to work up a connexion in this country. This, unfortunately, has resulted in failure, for while these handsome bangles are much admired, their diameter is not sufficient to pass over an Englishwoman's hands. The alternative of making the bangles hinged has not proved satisfactory.

Apart from the literary references already quoted, the antiquity of this cult is amply demonstrated by the remains of chank artifacts and workshop waste scattered up and down India at sites where no chank industry now exists, and by objects found in excavations at ancient sites stretching from the Indus Valley through Persia into Mesopotamia.

Today chank bangle factories are restricted to a few centres in Bengal; in very early times, often prehistoric, the industry was widely spread; remains consisting of quantities of broken bangles, associated with working fragments of the shell—apical waste, broken out columellae and lip fragments—furnish conclusive evidence of ancient factory sites at many places in Kathiawar, in Gujarat, in the southern Deccan and in

the Tinnevelly district of Madras (FIG. 5). The most important of these are as follow :—

1. In Kathiawar and Gujarat nine sites are known where working fragments have been found. Six are in Kathiawar (four in Amreli Prant, one at Valabhipur and one in Okhamandal), and three in Gujarat (Sigam on the Heran river, Kamrej on the Tapti and Mahuri in Vijapur Taluq).

2. In the southern Deccan and neighbourhood, four sites are noteworthy. They are :—Maski in the Raichur Doab, Bastipad in the

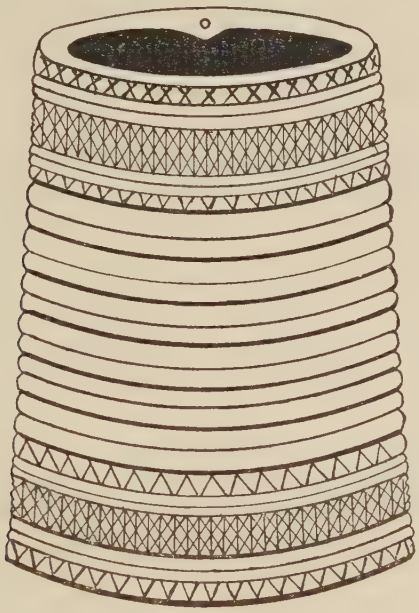


FIG. 4. GAUNTLET OF CHANK SECTIONS WORN BY SANTAL WOMEN, BENGAL

Kurnul district, Hampasagra, on the Tungabhadra and beneath the Buddhist ruins at Amaravati.

3. Sites among the mounds that mark the positions of the old Pandyan cities of Korkai and Kayal at the mouth of the Tambraparni river in the extreme south of the Peninsula.

Space lacks for any but a cursory notice of the most important of these sites—those of Korkai, Kayal, Amaravati, the Raichur Doab and Valabhipur, as at these we are better able to date the remains than elsewhere owing to their association with towns and buildings of known

historical record. With regard to the others, they have all been surface finds or from made ground and in consequence are undatable, apart from the doubtful inference drawn from their common association with chert scrapers, neolithic artifacts and iron remains, that they probably belong to the Early Iron Age of India. An earlier (neolithic) dating is impossible for no chert or flint saw could cut so evenly and smoothly as the surface markings indicate.

Of the various sites to be considered the presumption is strong that the one at Korkai (the Kolkoi of the Greeks) was the earliest to be established, seeing that the most productive chank fishery in India is located immediately off this part of the coast.

Korkai flourished from an indeterminate date antecedent to the Christian era down to one somewhere about A.D. 1000, when accretion of silt in the delta of the Tambraparni drove the inhabitants to build another city, Kayal, farther downstream at the new mouth of the river. All that remains of the older city consists of a series of mounds. Here, in 1912, I discovered a fine series of chank workshop waste at a spot adjacent to a place where old Pandyan coins have been found from time to time as erosion exposed the underlying deposits.

All the fragments of shell found bear distinct evidence of having been cut by means of a thin-bladed saw; striae run across the cleanly cut curfaces precisely as on sections cut in Bengal workshops at the present day. The majority are obliquely cut ' shoulder pieces ' ; others are columellae broken free and the rest are lip fragments trimmed away (PLATE III, FIG. 1).

That the industry continued to be carried on when the migration took place to the daughter city of Kayal—' the noble city of Cael ' as Marco Polo called it—when Korkai ceased to be a seaport, is rendered probable by the fact that here also I found an excellently preserved sawn shoulder piece with the apex broken out after the present-day habit of Dacca shell-workers. No memory of the former existence of shell-cutting lingers in the neighbouring villages, inhabited solely by poor fishermen whose chief claim to notice is that they are the zealous descendants of people who were converted to Christianity by St. Francis Xavier.

It is noteworthy that the huge funeral urns found in tumuli at Adichanallur in the valley of the same river that debouched in ancient times at Korkai and later at Kayal, have yielded a few fragments of similar workshop waste, associated with beautifully formed bronze utensils, iron weapons and gold fillets, now in Madras Museum. Although these remains are prehistoric, it is obvious that among the

people of those days there were already skilful artificers in gold, bronze and iron ; possibly their age was contemporary with one of the early periods of civilization that flourished in the Indus valley, in Mesopotamia and in Egypt.

Going northward into the coastal region of the Deccan we find evidence at the ruins of Amaravati that the chank bangle industry was carried on in this place before the existing Buddhist buildings were

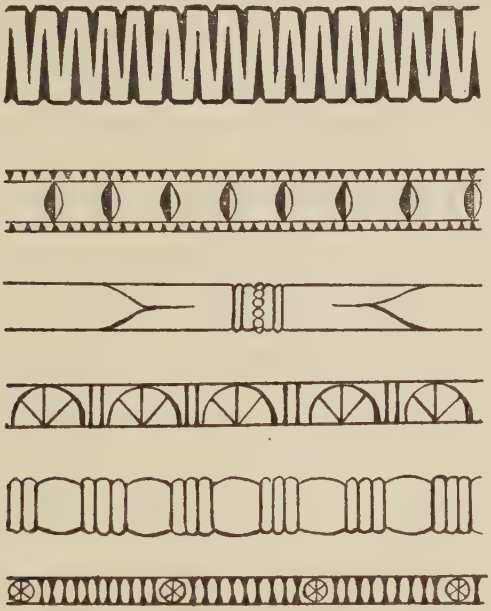


Fig. 5. PATTERN RECONSTRUCTION OF SOME ANCIENT BANGLE FRAGMENTS IN THE FOOTE COLLECTION, MADRAS MUSEUM
(For comparison with modern patterns)

erected ; all the working fragments and pieces of broken bangles which were found there by Mr A. Rea, Government Archaeologist, occurred beneath the foundations of buildings which competent authorities date *c.* 200 B.C. ; hence the bangle fragments must be at least 2100 years old. It may be that they constituted part of the town's rubbish dump before the erection of the Buddhist shrine and that this material was employed in making or raising the ground before putting in the foundations ; alternatively it may be that an old village, including the waste from a village bangle factory, was selected as their site by the Buddhist architects of Amaravati.

Besides bangle fragments, a few rudely carved chank finger-rings figure among the remains, together with small discs of $\frac{3}{4}$ inch diameter, perforated at the centre ; these discs were used in the fashioning of necklaces, for Mr Rea has found, at Peddamudiyam in Cuddapah, complete necklaces formed of spherical chank beads alternating with chank discs of similar pattern. The perfectly circular outline of these small discs is remarkable.

In the Raichur Doab of Hyderabad State, chank factory waste occurs in large quantities in the neighbourhood of very ancient and extensive gold workings discovered in recent years by mining engineers while prospecting.[1] At a very early time this region must have been the scene of great gold-mining activity though today its memory is entirely forgotten—perchance here was the source of the gold shipped at Ophir upon the ships of King Solomon's trading fleet nearly a thousand years B.C.

With wealth abundant, even if the actual miners were little better than slaves, articles of luxury would be in great demand ; of these, chank bangles certainly figured largely to judge from the great quantities of waste present. That the demand was backed by much wealth is demonstrated when we consider that it led to the establishment of an industry that had to depend upon raw material imported from a coastal district hundreds of miles distant—either from the north of Ceylon or from a port on the southern Coromandel coast. This material would be carried by sea to the mouth of the Kistna and thence up river to its destination in the west of the Nizam's dominions.

The third area, Kathiawar and Gujarat, where several important chank factory sites have been discovered, is well situated geographically to be a centre of such an industry ; the coast of Kathiawar is the only considerable source of chank shells on the west coast of India. Here the most important and extensive find has been in the ruins of Valabhipur, the modern Walah, and, as at Amaravati, it is associated with Buddhism. The story of Valabhipur goes back several centuries before the Christian era and for long it was the seat of the Valabhis, a Rajput dynasty ; its history is fairly well known and we have accounts by Chinese pilgrims which enable us to realize its importance in the second half of the first millennium A.D. The city was visited by Hiuen Tsang in the course of his fifteen years pilgrimage through India (A.D. 630–645) and by I. Tsing in the succeeding century. Both pilgrims describe it as a large and flourishing city and a great centre of Buddhist learning.

[1] Personal communication from one of the prospecting staff.

The most extensive factory site of all, is situated on the mainland of Okhamandal, immediately opposite the holy island of Beyt, lying off the northwest coast of Kathiawar. It was in this neighbourhood that were enacted many of the incidents associated in legend with the life of Krishna, before his deification. Here it was that he sported with the milkmaids, here he was king and here, too, occurred his tragic death.

On the shores of this sacred land chanks today are collected in thousands under permit from H.H. the Gaikwar of Baroda, who possesses sovereign rights over the fishery—a proof of the spiritual importance in which it is held ; all these sacred shells must be at the disposal of the successor of Krishna as the ruler of this land.

Every pilgrim who wends his weary way to this remote and now desolate region to pay homage at the god's two shrines of Beyt and Dwarka, desires to carry home one of the beautiful shells emblematic of the god. And although chank bangles are not now made or sold here, the industry must have been of great importance at some remote period if we may judge from the vast chank shell rubbish heaps found by Mr S. R. Gupta,[2] of the Gaikwar's Fishery Staff, at the site opposite Beyt Island, close to the place where pilgrims take ferry across to the shrine. The fragments are mainly apical and oral pieces cut off and discarded. With them are found many broken fragments of unfinished bangles, the whole being typical waste from a shell-bangle factory. That the industry was conducted on an extensive scale over a period of long duration is evidenced by the great abundance of the remains ; the Government lessee of the present-day chank fishery began to exploit the deposit soon after its discovery ; the material was sold at Surat, presumably for lime burning, at the rate of Rs. 14 to 15 per khandi of 20 Bombay maunds (560 lb.). It is curious that shell-bangle manufacture has entirely died out in this locality, not a single shell bangle being made in Kathiawar at the present time ; glass bangles are affected by the lower castes ; ivory ones are in favour with people in more prosperous circumstances.

According to Tod[3] a shrine of Buddha is preserved within that of Krishna at Dwarka and this, taken in conjunction with certain legends, indicates the probability that Krishna was originally an adherent of some early phase of the Buddhistic faith.

Reviewing all the evidence available, the curious fact emerges that

[2] J. Hornell, *Report to the Govt. of Baroda on the Marine Zoology of Okhamandal in Kattiawar*, London, 1916, vol. II, p. IX.

[3] *Travels in Western India*, 1839, under date 1 January 1823.

although the chank at the present day is held in greatest esteem by Hindus, the majority of the ancient seats of the chank-cutting industry were situated at centres where Buddhism flourished, for even at Korkai we have evidence that either Buddhism or the related creed of Jainism was the dominant religion at an early date in that locality.

No centre of ancient chank-working seems to have existed in the Indus valley. All we know is that a few chank artifacts have been found there, notably one at Chanhu-daro which Mackay[4] describes as ' a child's feeding cup made from a shell of the shape and date as found at Ur and Kish in Mesopotamia : a Harappa culture relic '. For the purpose named its large size makes it quite unsuitable ; chank shell feeding cups or spouts are common objects in south Indian bazaars and are all made from small shells, 3 to $3\frac{1}{2}$ inches long (PLATE III, FIG. 2); I feel certain that the Chanhu-daro shell was a libation vessel used in worship before the shrine of a god. The Harappa culture as Mackay and others have shown is to be dated some time in the second half of the third millennium B.C., being related to Mesopotamian culture of this period. In this connexion, as bearing upon the antiquity of trade relations between India, Persia and Mesopotamia, some interesting exhibits are to be seen in the Louvre Museum, Paris. The most noteworthy is a chank shell cup, such as would be used for libations, found by the Mission Dieulafoy in the ruins of Susa. It measures $6\frac{1}{2}$ inches in length and has been longitudinally bisected a little to one side of the median line, the larger portion being retained to form the cup. The columella has been cut away and the result gives a very serviceable form of spouted cup. It is classed as of Achaemenid age—say *c.* 500 B.C. From the same ruins the Mission de Morgan brought back a fragment of a large chank bangle nearly one inch wide (no. A 7532), roughly ground to a triangular ridge pattern in section.

Again at the excavations at Tello (Lagash) the Mission de Sarzec discovered a number of perforated chank shell plaques sometimes very finely engraved ; one in particular (no. 221) bears a spirited representation of a lion leaping upon the back of a bull. These objects apparently were ornaments or amulets worn suspended from a cord.

As the chank does not occur in the Persian Gulf, these objects must have been imported from Kathiawar, for this is the nearest locality where the shell is to be found ; it is just such an article as could easily pass from hand to hand among the fishermen of the Mekran and Persian coasts.

[4] E. Mackay, *Illustrated London News*, 21 Nov. 1936, p. 908.

From consideration of everything we know concerning the chank shell industry, the chief conclusions which I draw may be summarized as follows :—Originally the chank had a simple magico-religious significance, an instrument used against the forces of evil by the animistic tribes which once constituted the entire population of India. Later, with the advance of man's culture, his conception of an ordered universe began to emerge ; then, when the forces of good and evil were at last marshalled in orderly manner in what we now call the Brahmanic religion, the chank cult was incorporated and given much of that greater importance which it now holds in modern Hinduism.

When the religious reformation known as Buddhism arose, grew and flourished, the cult lost some of its importance in India, but to counterbalance this loss its use in personal adornment seems to have increased, aided partly by greater facility of transport and partly by the better skill of the craftsmen employed in the manufacture of the cutting tools required in the making of ornamental bangles such as we see on the arms of the women so numerous in Buddhist sculptures.

With the spread of Buddhism and Brahmanism the cult threw out arms that reached through Tibet to China, and by sea routes to Burma, Thailand and Cambodia.

At the present time every human action from birth to death is touched by some aspect of the chank-cult among the people of southern India ; babies are protected against illness and misfortune by amulets ; when weaned, they are fed with milk through the spout of small chanks that replace our glass feeding-bottles ; the chank trumpet is blown during weddings ; a pair of red chank bangles are the equivalent of the European wedding ring ; women wear ornamental bangles, rings and necklaces made from the shell for personal adornment ; cattle and dwellings are protected from the evil-eye by it ; it is burned to make lime for the whitewashing of temples and of the newly built houses of the wealthy ; when people are sick, water which has been in contact with a chank shell is reputed to be a cure for many ills and specially for skin troubles and eye disease ; and when the deity has to be propitiated, his image requires libation poured from the mouth of a chank shell and his attention has to be invited by blasts on a chank trumpet. And when death comes, the sad fact is announced by the melancholy wailing of the shell, and, in the case of a woman, the chank bangles which were her pride during life are smashed and thrown away.

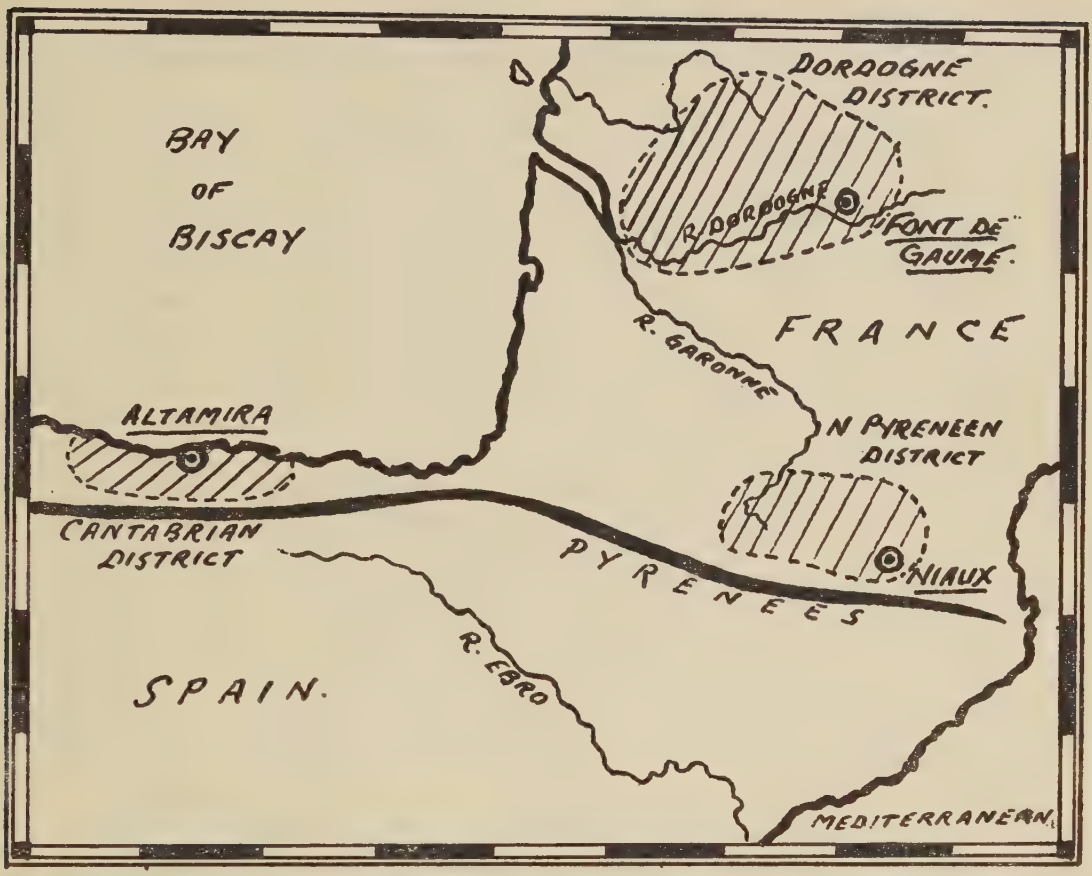
Palaeolithic Paintings—Magdalenian Period

by W. H. Riddell

IF we mark upon a map the sites of those caves and rock-shelters which contain examples of palaeolithic paintings and drawings we find that in the Franco–Cantabrian region (which comprises south-west France and northwest Spain) they fall naturally into three well-defined groups, the particular district in which each group is situated being decided accidentally, or rather geologically, by the occurrence within it of a number of limestone caverns no great distance from each other. And when we make a more detailed study of these groups we find that there is in each group one cave wherein the art of the district is at its best—a cave that we may consider the art-centre of its district. The three cave-groups in question are to be found respectively in the Dordogne district, of which the outstanding cave is Font de Gaume ; in the northern Pyrenees district, wherein most of the best art can be found at Niaux ; and in the Cantabrian district of northwest Spain, where the cave of Altamira is pre-eminent by reason of its wonderful painted ceiling.

The three caves named above are more widely separated than appears at first sight. They stand approximately at the three angles of a very large isosceles triangle the apex of which is Altamira, and the two base angles are respectively Font de Gaume and Niaux (see sketch map). Each of the two long equal sides of this triangle measure roughly 300 miles, which is the distance between Newcastle on Tyne and Winchester, while the shorter base of 150 miles is the distance between London and Plymouth. In the days when ' foot-slogging ' was the only means of travel these distances were considerable. On foot 30 miles, or eight leagues, is a fair day's journey ; 60 miles, or sixteen leagues,[1] a very long one, hardly to be accomplished in the daylight hours. When Pheidippides, before Marathon, carried the appeal of Athens to Sparta his great ' trek ' of 140 miles in two days was sufficiently remarkable to make history. In normal travel, Altamira was distant from Font de Gaume or Niaux ten days' journey and the two

[1] I am using here the Spanish league (*legua*) which is 6 kilometres or $3\frac{3}{4}$ miles, because it represents one hour's journey on foot at normal gait.



SKETCH MAP SHOWING THE THREE PAINTED-CAVE DISTRICTS OF THE FRANCO-CANTABRIAN REGION
Scale : Black and white divisions of border each = 50 miles.

For clarity's sake I have marked on the map only the principal cave of each district—the districts themselves being shown as shaded areas enclosed within dotted lines. The following is a list of the Caves in each of the three districts where the most important examples of mural art can be found.

DORDOGNE DISTRICT	N. PYRENEES DISTRICT	CANTABRIAN DISTRICT
Font de Gaume	Niaux	Altamira
Combarelles	Les trois frères	Castillo
La Mouthe	Tuc d'Audoubert	La Pasiega
Teyjat	Marsoulas	Hornos de la Peña
Cap Blanc	Gargas	Pindal
La Grèze	Mas d'Azil	Covalanas

latter were five days' journey apart.[2] In the more populous parts of Africa shorter distances than these habitually separate the communal centres of neighbouring tribes, as, centuries earlier, they had done in ancient Greece.

We have therefore reasonable grounds for supposing that in Upper Magdalenian times, at which date palaeolithic art had reached its apogee, the peoples or tribes which inhabited the three districts of the Dordogne, the North Pyrenees and Cantabria, though of much the same race and language, had in the course of centuries diverged to some extent in living habits and more particularly in personal adornment; as much perhaps as contiguous native tribes of the same original stock had done in Kenya Colony when the English arrived in their midst half a century ago.

The only direct evidence we have that this divergence took place is the noticeable differences of style in the art of these three districts, more especially in the fine paintings of Upper Magdalenian date—the period of the great polychromes. Although these differences of style are by no means so striking as the wide difference between Franco-Cantabrian art in general and the Capsian art of east and southeast Spain (which can only be accounted for by difference of race) they are, when critically examined, almost, if not quite, important enough to justify a division of the whole Franco–Cantabrian school at this period into three sub-schools, in accordance with the three geographical divisions into which it naturally falls.

As no great stress has been laid upon these differences of style by prehistorians, it might be worth while to examine them in some detail from a painter's rather than from a prehistorian's point of view: that is to say making their style rather than their date our chief consideration.

Let us consider first the many 'best period' drawings of bisons, a number of them in full panoply of polychrome which may be found at Altamira, Font de Gaume, and Niaux. The bison of the Pleistocene (*Bison priscus*) was to the men of the Old Stone Age what the roast beef of Old England was to our forbears. Judging from the frequency of his portraits no animal was held in higher estimation. Of the bison alone can we say that numerous drawings of him of the highest excellence exist in all three of our districts alike. First-class paintings of mammoth and reindeer exist only in the Dordogne. There is an admirable

[2] On the ground Altamira is rather further from Font de Gaume than from Niaux. A traveller from Altamira to Font de Gaume has to skirt the wide re-entrant made by the Bay of Biscay which adds nearly an extra day to his journey.

cave painting of an ibex at Niaux in the Pyrenees ; there are none of much value elsewhere. Good pictures of the wild boar figure at Altamira alone. Reasonably good drawings of horses, it is true, exist in all three districts and the same can be said of that other favourite game-animal the red deer, but compared to the bison drawings they are in general poorer in quality and much fewer in number. Consequently the bison is the one beast which best serves our purpose. For when it comes to comparing styles it is an obvious advantage to have for reference as large a number of first-class paintings as possible of which the actual subject is the same.

When we examine critically these many bison drawings we become aware that at Altamira there is a certain family resemblance, illusive but perceptible, running through all the bisons on the ceiling—a likeness due not only to similarity of subject but to similarity of treatment and outlook. And this same likeness will be found to extend to the lesser and slighter drawings in neighbouring caves such as Castillo and Pindal. We note again an even more marked resemblance, *though of an entirely different type*, between all the bisons at Font de Gaume—a resemblance extending to the bisons at Combarelles nearby. Finally, when we turn to the monochrome drawings of bisons at Niaux, we find here also a strong family likeness quite dissimilar to the likenesses that pervade and underlie the bisons at Altamira and Font de Gaume.

These various likenesses and differences are easier discriminated than described. What is perhaps the most striking feature of the Altamira bisons is the obvious attempt on the part of their painters to go beyond the realism of surface-facts in order to give a vivid impression of the bison's strength and massiveness. To these men bisons were at the same time formidable and appetizing. Their bulk filled as it were their painter's eyes with meat. I should add that the very strong likeness that exists between certain of these Altamira bisons suggests that, in two instances, two of them, and in one instance three, are the work of one artist.[3] But this is not now so important as to note that all, or *nearly all*, these bisons show an underlying family resemblance such as would naturally occur in the work of painters belonging to the same school. I say ' nearly all ' advisedly, for as we shall see later, one or two of them hardly fulfil this condition.

In contrast to the Altamira bisons those at Font de Gaume are in

[3] For a further discussion of this point I must refer readers to my *Altamira* (Oliver and Boyd, Edinburgh, 1938).

general more theatrical. Their painters, in their search for impressiveness, resort to over-exaggerated contours and a further straying from the tyranny of facts. The balance between truthful representation and record of impression has, at times, been tipped too far in favour of the latter, with the result that the very real impressiveness of these drawings tends in the more ornate examples to become caricature. The ' meatiness ' we have already remarked at Altamira is further emphasized: nor is this characteristic confined to the bisons alone. Horses, reindeer and red deer are all depicted, apparently with intention, in a higher condition of fat than wild animals normally carry; and we should probably be right in regarding this fatness as a ' wish ' feature very natural among hunting folk.[4]

Nothing could be more surprisingly different from these Font de Gaume bisons than the monochrome examples at Niaux. We find here a school of draughtsmen whose chief aim appears to be a precision of likeness. In spite of some technical crudity we can see that these Niaux painters intended to depict, not the grandeur of a bison as at Altamira or his ' meatiness ' as at Font de Gaume, but his actual appearance in the flesh. That they have not wholly succeeded is due to a tendency common to all primitive artists to overstate certain small but salient features such as the eyes, and to shirk the difficulties of drawing which legs and feet present. But when artists work, as these cave painters must have done, almost wholly from memory and never direct from a model, such discrepancies are inevitable. Our best test is to compare these drawings with a living specimen of the Lithuanian bison (*Bison bonasus*) or with a photograph of one. We see then that it was this beast or one closely resembling it (as *Bison priscus* did) which the Niaux painters intended to portray, and not for instance the very different looking bison of the American plains (*Bison bison*). It would be a waste of time to apply such a test as this to the highly generalized bisons at Font de Gaume.

An equal realism of presentation governed the modelling of the two famous clay bisons at Tuc d'Audoubert, which is 25 miles, or only seven hours' journey, from Niaux. No one can surely fail to miss the

[4] It is impossible to overestimate the importance of fat among these ancient hunting tribes. The climate was a cold one. Fat as a food was then as highly appreciated as blubber is by an Eskimo. In the form of grease, probably mixed with red ochre, it made an unguent to protect the hunters' naked bodies from chill and damp, and it formed the only *smokeless* illuminant available for the cave-artist, who used it also as a medium with which to mix his pigments. It had, in fact, the same universal usefulness that olive oil had later in ancient Greece.

obvious likeness of these clay models to the Niaux drawings, or to note how little they resemble in either outline or outlook the bisons of Altamira and Font de Gaume. It matters little whether these models or the Niaux drawings were first done. Both, I understand, are attributed to much the same Upper Magdalenian date.

Although the bisons of Altamira, Font de Gaume and Niaux have each recognizable family likenesses, and these likenesses differ wholly *inter se*, neither likenesses nor differences are immediately perceptible to a casual observer. But that is no proof that they do not exist. The difference between the paintings of China and those of Japan is on first acquaintance inconspicuous enough, but no connoisseur of Far Eastern art worthy of the name is likely to mistake one for the other. In the same way experience enables us to recognize among Italian paintings those that preceded, and those that followed, the great break and change brought about by the sudden discovery and influence of the Antique. Our present inquiry makes no greater demand upon our faculties of perception.

To illustrate broadly the stylistic differences between the master works at Font de Gaume, Niaux and Altamira we might compare the grand style of Font de Gaume to the hieratic work of the great Italian masters ; Niaux to the scrupulous and loving realism of the Dutch ; and Altamira to the regal and spacious impressionism of Spain from El Greco to Goya ; not forgetting, though this has nothing to do with it, that it was above all upon Velazquez, chief of all Spanish masters, that the cloak of these great animal-painters fell. Had he so wished he could have become the greatest animal-painter of all time. As it is his dogs are unsurpassable, and the dozing watch-dog of Las Meninas is of all dogs the most immortal.[5]

If we were to be guided by considerations of style alone, we should, I think, come to the conclusion that those palaeolithic masters who at the earliest date attained an assured mastery of their art—that is to say became masters, were those who inhabited the Dordogne district—belonged, if I may so put it, to the large and prosperous tribe whose chief art gallery was Font de Gaume.[6]

[5] It is a Spanish mastiff. You can see its counterpart on any big Spanish farm today ; in Bewick's *Quadrupeds* (1789) it figures as the ' Ban Dog '—an admirable portrait.

[6] This tribe probably never exceeded two or three hundred souls at any time in its existence. The distribution of the Australian hunter-aborigines when the English arrived was about 1 man to every 45,000 acres. Hunting tribes are never thick upon the ground.

A majority of the best paintings in this cave have about them a certain primitive air whether their subjects be bisons, mammoths or reindeer. One or two drawings of horses and the admirable painting of a wolf are about the only exceptions. From the Dordogne, the influence of a higher art-level seems to have travelled at first southwestward across the great sandflats of Les Landes to the Cantabrian hill-tribes of Spain, whose artists at Altamira (but nowhere else) were destined to surpass their masters by just so much as Velazquez, shall we say, surpassed Tintoretto or Veronese. Last of all, if any reliance can be placed on art-analysis, this influence passed from Altamira along the northern slopes of the Pyrenees to Niaux travelling by way of Lourdes perhaps to Marsoulas, in which cave two bison-drawings show a considerable affinity to the Altamira style—an affinity all the more remarkable because Marsoulas is nine days' journey from Altamira and only a one-day journey short of Niaux.

Now the route above indicated is, oddly enough, the longest possible way by which the influence could have passed from Font de Gaume to Niaux. It is actually four times as long as if it had passed direct. Passing over the fact that savages have normally a roundabout way of arriving anywhere there may be a good reason for this procedure. In primitive ages dwellers of the plains and lower river-valleys do not as a rule ' lift up their eyes unto the hills '. The hills do not inspire hope but fear. The Pyrenees viewed from the north, whence the Dordogne hunters must needs come, appeared to them a dark and terrible barrier across which even the midday sun struck cold. Nor did they find the game there more plentiful and various than at home. In those days ibex and chamois were as much denizens of the lower river-valleys as bison, horses and reindeer. They had therefore no call to thread further the grim head-waters of the Garonne. For the Cantabrian hunters on the other hand the high hills held no mystery; they were ever at their door and home-like. Such men would instinctively cling to their familiar foot-hills. Rather than face the strange-seeming barren levels of Les Landes between them and the Dordogne they would work their way eastward foot-hill by foot-hill until at last they came to Marsoulas and Niaux.

Whatever the reason, the fact remains that the style of Niaux is much closer akin to the style of Altamira than it is to that of Font de Gaume. It is also, if style is any criterion, the most sophisticated and recent of the three, in spite of the fact that the best drawings at Niaux lack the elaboration of colour. Whether or no this opinion is confirmed

by the chronological researches of prehistorians I am not sure ; but I believe that Niaux is commonly considered a late cave containing no drawings earlier than Magdalenian, although Aurignac itself is no great distance away.

For fear of confusing our argument I have so far avoided discussion of the technique of these paintings and drawings, but this factor is too important to neglect altogether. The technique of the Niaux drawings, though monochromatic, assimilates closely to the technique commonly employed in the Altamira polychromes. The Altamira artists obtain much of their modelling by a skilful gradation of the various colours used, and utilize black mainly for the strong outline and accents that bring together and unify their work. The Niaux artists, ignoring colour, possibly because there was little or none of it available, and omitting all attempts at gradation of tone, copy closely the strong outline and accents of Altamira as if unaware that this part of the work is in reality no more than the necessary complement to the colour-gradations —the bones, so to speak, upon which thec olours are the flesh. They have in fact given us the skeleton or scaffolding alone much as a poster-artist will work in simple outline and disregard interior modelling. It is for this sophistication of theirs, as well as for their greater naturalism, that I have suggested for the Niaux drawings a later date than those upon the Altamira ceiling. This is, of course, a personal opinion only ; there being no valid reason, so far as I am aware, to prevent anyone taking a contrary view.

The Altamira artists on the other hand seem to have borrowed much of their technical methods in colour from the Font de Gaume polychromes and rapidly improved upon them. There is a certain woolliness and hesitance about the polychromes at Font de Gaume which suggest tentative experiments in an unfamiliar medium. We get the impression that these painters were groping their way step by step. Although much of the apparent woolliness results from the present comparatively poor condition of these paintings, there remains enough to show that the draughtsmanship at Font de Gaume was in general less confident in character than it was in the better preserved work at Altamira and Niaux. We can see that Font de Gaume painters relied more on colour gradations and less on strong outline and accents than the Altamira artists did ; and this alone serves to give an aspect of weakness and tentativeness to much of their work. The drawing of the wolf however stands out again as a notable exception to this generalization.

There is a further reason for thinking that these masterworks at Font de Gaume are the earliest in date. There are at Altamira, as I have mentioned, one or two aberrant drawings out of keeping with the rest. In them it is possible to recognize a fleeting resemblance to the Font de Gaume style. The more important but less convincing example is that of a standing bison into whose shoulders some later artist had intruded the drawing of a wolf's head.[7] This painting, which in position is the centre-piece of all the large polychromes, looks more primitive and less confidently drawn than the rest; for which reason perhaps it recalls the style of Font de Gaume. There is a more notable example nearby—one to which the elongated foreleg of the unfinished wild horse acts as a pointer. I refer to the two small bisons in monochrome which look as if they had been done with charcoal and stump, and are dated by the Abbé Breuil[8] considerably earlier than the polychromes. I would call attention in particular to the right hand one of the pair—the one which faces left. Had I seen this drawing with its place of origin concealed, I should have attributed it confidently to a Font de Gaume painter. It has all the characteristics of a Font de Gaume bison—the exaggerated size of the neck-hump (which French prehistorians call the *chignon*), the tumultuous run of the back's contour and the over-emphatic protrusion of the dewlap which Font de Gaume artists appear unable to resist. It was probably the tumultuous run of these bisons' backs in the *Grande Gallerie des Fresques* at Font de Gaume which suggested to succeeding artists their likeness to mammoths, and led to the superposition upon them of the mammoths which now obscure their outlines. Be this as it may, the existence at Altamira of an *early* drawing of a bison closely resembling in general characteristics *and in technique* a number of bison drawings at Font de Gaume, supports the view that there existed in mid-Magdalenian times some intercommunication between the two districts —Cantabria and the Dordogne—and that the former derived some aid at least in its art from the latter.

This is by no means impossible. In summer the tribes which inhabited the three widely separated ' painted cave ' districts had need to travel long distances in pursuit of game, becoming, at this season of new growth, as nomadic as their quarry. The various tribes must on

[7] This wolf's head may perhaps represent the disguise of a wolf's mask and skin successfully adopted by the bison's hunter. Catlin in his *American Indians* depicts a couple of hunters thus disguised stalking a bison herd.

[8] *The Cave of Altamira*, by H. Breuil and H. Obermaier. (Madrid 1936).

occasion have been in touch with each other or, at any rate, sufficiently aware of each other's existence to enable an artist with a 'wanderlust' to pass (had he so wished) from one tribe to another. The amount of their art which has survived—a minute fragment only of all that was produced—is a clear proof that these men were natural lovers of art. An artist, coming from the Dordogne, would find a ready welcome and even hospitality and shelter throughout a winter from the Cantabrian cave-dwellers, especially at a date when he could still show them a skill in art superior to their own. It is in some such way as this that we can best account for the presence on Altamira's ceiling of Font de Gaume work before its great polychromes.

But we must beware of pursuing this line of argument too far. The perversity of human nature persists in according more admiration and veneration to the work of a man's hands than it does to the man who made it. A Masai warrior, for example, regards his spear with the utmost veneration; it is the last thing he will part with, and yet the smiths of his tribe, who fashion the spears from soft iron, are if anything rather looked down on. So incidentally was Hephaestus on Olympus. Modern civilization can produce parallel examples. Habitual novel-readers will often speak with enthusiasm of a book they have just read and yet be unable to tell you its author's name; and I know at least one enthusiastic admirer of the Japanese colour-print who will not familiarize himself with the signatures of even its few great artists sufficiently to be able to recognize them with certainty. We are forced to the conclusion that a work of art has always won greater consideration than its maker. In this view, strangely enough, the artist himself concurs. No sincere artist has ever regarded himself as of more importance than his work.

We may be confident then that in the Old Stone Age it was the great drawings on the cave-walls that excited all the wonder and admiration, while the men who did them passed by unnoted and unpraised. But we must remember too that a large capacity for wonder is not the natural birthright of a savage. His mind is unequal to the strain. It has been well said that the African native's capacity for wonder was exhausted the first time he witnessed the striking of a match. After that the other miracles of the white man—the long range action of a rifle, the way of a motor-car on the land, or an aeroplane in the air—elicited little further surprise. The motor-car indeed, because of its clatter, he dubbed irreverently *tinka-tinka*, which is his name for a babbling brook, and the arrival of the first aeroplane got from him

no more than the shrugged comment of boredom, *Msungu 'ndegi*—white-man-bird. An appreciation of beauty, on the other hand, is a much stronger factor in a savage's life. I have never yet seen a native of Africa make the smallest blunder in a colour scheme when it was a question of his personal adornment for a dance. It is only when he tries to imitate the white man that his innate good taste ' goes west '.

We may guess then that the attitude of the Stone Age hunter to his art was as much one of pleasure as of wonder. Whatever part his art played in his religion it was not a primary one and not entirely a ritual one. The cave-paintings formed perhaps little more than a decorative, although no doubt an essential, background to whatever his worship or ritual was : very much as the Stations of the Cross painted round the walls of a Catholic church form a pictorial commentary to the Celebration of the Mass.

The indication of wounds or of spear and arrow heads upon the paintings of animals has been considered to have a magical significance. There are a number of such drawings at Niaux though they are by no means universal, while elsewhere they are decidedly rare. Had they always had a magical intent they would surely be more frequent than they are. Their greater frequency at Niaux than elsewhere may be an additional indication that these drawings are late in time. When the Font de Gaume and Altamira drawings were done this marking of wounds had clearly not come into vogue. But perhaps our more logical course would be to regard the marking of these wounds as a very natural addition to some later, though not necessarily idle, or mischievous, hand.

In all probability the many enigmatic and apparently meaningless drawings in the caves bring us much closer to the arts of divination and magic. A series of spots such as the so-called rebus at Niaux, an assemblage of unintelligible signs as at La Pasiega,[9] the long serpentine laddering in the small alcove at Altamira, or the meandering strokes made by fingers in wet clay as at Hornos de la Penã (the so-called Macaroni) were perhaps the recondite means whereby these ancient hunters, either on their own initiative or through the medium of a medicine-man, sought propitious auguries for their morrow's hunting. Read what Major R. S. Audas has to say about native hunters in the Sudan :—

[9] Both reproduced in Baldwin Brown's *Art of the Cave-Dweller*, figs. 105, 41. A drawing beside the Pasiega signs has been interpreted as the sole of a human foot. It almost certainly represents the spoor of a cave-bear, all five toes being of equal size and length.

' as the Irishman " runs over the cards " and the cook-general " tells the tea-leaves " so the native hunter impressing his fingers in the sand to make a series of magic marks, which will always be unintelligible to an Englishman, deduces the success or failure of a day's sport '.[10] There you have much the same tricks of divination in full action to this day.

Paradoxically enough, much of this ancient art is too good, too full of a genuine striving after perfection, for its object to be the awakening of awe. For the worship of mumbo-jumbo any stock or stone will serve and for magical practices any kind of scrawl. The conical stone symbol which was the centre of Aphrodite's cult at Paphos was an object of infinitely greater veneration than her statue by Praxiteles at Cnidos. The ancient wooden image of Athené on the Acropolis, scrupulously saved from Persian destruction, was the one for which, every fifth year, Athenian maidens embroidered the sacred *peplos*, not for the magnificent chryselephantine statue of her by Pheidias which was the glory of the post-war Parthenon.[11]

The Stone Age artist shows an obvious anxiety to get things right even at the expense of leaving in view every original error corrected. One painter will give a beast five, six or even eight legs in the hopes of getting four of them right, as may be seen at Altamira where the artistic conscience was high ; and only by line after tentative line upon the ivory of La Madeleine did another artist bring the true set of lines together that give us in a few square inches of space an overwhelming impression of a mammoth's furious charge.

The search of these artists for accuracy implies the existence of a strong body of appreciation and of its necessary complement, criticism, which is, above all things, the bugbear of that unquestioning reverence upon which a priest-craft thrives. Nor is this search of theirs a later manifestation only ; it dates from at least as early as the woolly rhinoceros of Font de Gaume which the Abbé Breuil considers late Aurignacian.[12] But for mere chance we should not know how truthful this drawing is. The odd looking neck-hump, here so well shown, was fully borne out by the discovery in 1911, thirty feet underground, of a

[10] Capt. H. C. Brocklehurst, *Game Animals of the Sudan*, p. 170. (Gurney & Jackson, 1931).

[11] This is substantially the same view as that taken by Professor Marcellin Boule in his *Fossil Men*, see p. 257, note. (Oliver and Boyd, Edinburgh 1923).

[12] This beast has already the marked *embonpoint* so common in later drawings in this cave. Professor H. F. Osborn considers it Early Magdalenian.

woolly rhinoceros with neck-hump complete at Starunia in Galicia.[13] The curious dip of the long head also, with nose pointing groundwards, would have seemed an error of observation did we not know that this is the precise manner in which the white rhinoceros of the Sudan (*Ceratotherium Simum Cottoni*) invariably wears his head.[14] This latter beast has also the neck-hump of the woolly species (*Diceros tichorhinus*) and except for its hairlessness probably resembles it closely.

A further instance of fidelity to facts comes from an early drawing of a mammoth at Combarelles.[15] The two ' lips ' at the trunk's end that guard the exit of the nostrils have a wide spatulate form so different to that of the present African and Asiatic elephants that we might suspect an error or exaggeration, had not the discovery of an almost complete mammoth's trunk in north Siberia proved the truth of the Combarelles artist's observation.[16] We may be sure also that the curious high-domed heads with which these early artists endowed their mammoth-drawings had a very real existence, although no mammoth-carcase has so far endorsed it. It was perhaps, as Professor Osborn says, in part at least a fat-reserve, like the camel's hump, variable according to the season—at its largest after the rich summer feeding, at its least at winter's end. It was inevitable that these early hunters, to whom fat was so great an asset, should have given it its largest proportions.

Attractive side-issues have lured me from my main thesis, which was the discovery of sufficient evidence to justify our division of the Franco-Cantabrian art-school into three sub-schools. On this subject however, there is little more to be said with advantage, and what direct evidence there is we have already examined.

An attentive reader will have noticed that besides deriving my evidence almost wholly from drawings of bisons—the reason for which I have already explained—I have cited only those works of art which are on the walls or ceilings of caves, and have ignored the innumerable small works of art which do not come under a ' fixture ' heading.

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[13] H. F. Osborn, *Men of the Old Stone Age*, p. 209.

[14] See Brocklehurst's *Game Animals of the Sudan*, illustrations facing pp. 107, 108, 110.

[15] Reproduced on the cover of S. Reinach's *Repertoire de l'art quaternaire*. (Paris, 1913).

[16] This was the specimen found in 1907–8 on the Sangayurakh river, and later presented to Paris by the Count Stenbock-Fermor. See Bassett Digby, *The Mammoth*, pp. 211–12. (Witherby 1926).

Prehistorians rather arbitrarily, but very conveniently, divide palaeolithic art into two main categories: mural art (*l'art parietal* of the French) which comprises all paintings, engravings, and sculptures on cave-walls, roofs or floors; and movable or portable art (*l'art mobilier* of the French) which comprises all those small carved or decorated objects which excavation has brought to light. My reason for confining my attention to the former category alone is an obvious one. Mural art cannot run away. Wherever it is found, there it was done; whereas portable art-objects may be and, no doubt, often are, found elsewhere than at their place of origin. The discovery of sea-shells in caves and tombs far from their proper habitat points to their use for barter and trade, and who can say how often some delicately decorated *bâton de commandement* (or shaft-straightener ?) changed hands in the way of exchange before it was broken or lost. The very fact of its mobility puts it out of court so far as our present inquiry is concerned.

There is another more cogent reason for disregarding portable art-objects. They do not help our investigation. Apart from the unreliable accident of the place where they were found they have, so far as my eyes can discern, no special characteristics by which we could attribute them to any one particular sub-school. I have an idea—borne out by the many interesting little engravings on stone found at Limeuil[17]—that most of these small objects were decorated by young hunters during their more leisured moments, or at any rate by those still on the active list—by amateurs, one might say, or aspirants in art, in contradistinction to the cave-paintings which, as the more important work, the elders of the various tribes—priests perhaps or medicine-men—kept jealously in their own hands.

It may be that the convenient division of palaeolithic art into the two categories 'mural' and 'movable' is not so arbitrary after all. This division would assume at once a very real and unexpected significance if for the word 'mural' we read 'sacred', and for the word 'movable' we read 'profane', giving to this latter word its original Latin implication—'without the temple'. Those who believe that the intention of all this art was magical, and those who believe that its intention was purely decorative, would find a common ground for agreement, whereon both would be right, if they were to regard the

[17] See *Limeuil; son gisement à gravures sur pierre de l'Age du Renne.* (Capitan et Bouyssonie, Paris 1904). These Limeuil engravings, many of which look, as Professor Baldwin Brown has pointed out, like the practice-pieces of students, are almost certainly a local product.

decoration of the caves as essentially a religious undertaking with a magical basis, and at the same time regard the making of most small *objets d'art* as no more than practise, the pastime of an idle hour, or the gratification of an aesthetic sense ; although a small minority of them had no doubt some votive purpose.

It is impossible to believe that the great mural art of the caves, deep hid as it commonly was in an awesome darkness and stillness, had neither religious purpose nor magical significance. It could have had no other object. It is almost equally impossible to believe that every decorated piece of wood, stone, ivory or horn had a ' good luck ' intention and constituted some kind of fetish or charm. It is at any rate inherently unlikely. By dividing the art of these ancient hunters into two distinct branches, the religious and the secular, we in no way outrage common sense. We are but doing to their art what has been done ever since, naturally and inevitably, to every other art-manifestation throughout the centuries and all over the world.

Most of the little objects of ' movable ' art and all the few really good ones are naturalistic in treatment, as naturalistic as the curious muddle of small engravings on stalagmite in the Grotte de la Mairie at Teyjat which are a little outside the main run of mural art.[18] These Teyjat engravings are remarkably faithful renderings of *things seen*, the three aurochs perhaps the best, and as such they are closer to the ' movable ' art than they are to the *things emotionally felt* which so many of the great cave-paintings are. But about this it will not do to dogmatize too much. So very few specimens of ' movable ' art of really first-class workmanship have survived ; not more than a score rise above the level of student or amateur-work, although among this small number there are a few outstanding master-works such as the mammoth of La Madeleine already mentioned, the galloping reindeer of St. Marcel, the splendid carving of a neighing stallion's head from Mas d'Azil and the fragmentary Lorthet group of stags crossing a salmon river. In the last mentioned, the delicate drawing of the deer's legs is worthy of a Greek vase. One of my particular favourites is a delicious row of alert chamois heads engraved along both sides of a *bâton de commandement* found at Gourdan in the Pyrenees. Some unforgivable collaborator has done his best to spoil this little masterpiece by inserting on one side the clumsily drawn heads of a stag and hind, and on the

[18] Copies of these engravings by the Abbé Breuil are in the *Compte Rendu* of the 14th International Congress of Anthropology and Archaeology. (Geneva 1912).

other a still clumsier head of some unrecognizable animal, perhaps a wolverine. Such additions are proof positive that this *bâton de commandement* passed from the hands of its original decorator to someone less worthy to own it.

One thing is sure ; whether they were young or old, the men who made all these small art-objects were hunters and, what is more, successful hunters. Nothing less than a high level of success could have given them leisure to produce, with the intractable means at their disposal, the amount of work they did. And yet hunting as a means of livelihood is, even when game was as plentiful as it was then, an arduous and uncertain business demanding not only physical endurance but a considerable degree of shrewdness and cunning. Although much of their hunting-craft was innate animal-instinct and many of their hunting methods more or less routine, no two stalks are alike and some amount of initiative, observation, and originality on the part of the hunter was a mere necessity. And when we consider the weapons with which Stone-Age man went armed we can only stand amazed that he ever won a meal.

The men who did these drawings were not fools. In those hard days no fool survived for very long. The same observation and intelligence which made their hunting so successful is the very mainspring of their art. Because the game they hunted was rarely if ever out of their thoughts these men passed their leisure, the few artists among them in drawing or carving, the majority in miming, in their dances, the actions and appearance of their quarry, as the notorious sorcerer of Les Trois Frères, who is no sorcerer but a dancer or dance-leader, bears eloquent and picturesque witness.

We need little wonder that this great art died out with the disappearance of hunting as the sole resource of life. The quick observant mind essential for a hunter was no longer in demand. The cultivation of the ground, once begun, calls for little further originality and inventiveness, or else the agriculture of southern Spain today would have evolved rather further from the neolithic than it has. Stock-keeping and the care of domestic animals is a bucolic business, much of which among native stock-owning tribes is to this day delegated safely and successfully to the very young, while their elders go raiding for more cattle or sit at home and dream.

The relics of palaeolithic art that remain can be only a minute fraction of what was produced, although it is possible that most of the paintings in the far interior of caves have survived, for, if not, why have

any of them survived at all ?[19] But the small objects of ' movable ' art now surviving cannot represent a thousandth part or more probably a ten-thousandth part of what was made. Everything in wood, and there must have been much of it, has vanished, and the greater part of those in horn and bone. All the dressed hides too, which were once perhaps as popular for ' canvases ' among palaeolithic painters as they were among the American Indians, have perished aeons ago. Had a large number of palaeolithic ' movable ' art-objects survived it would have been easier to find evidence in support of my thesis or to prove it definitely wrong. The existing evidence is insufficient to do either. Its presentation, however, has not been wholly in vain. It has at least given me the opportunity to gossip for a few moments, although from a painter's point of view only, about these works of art, which are, considering the people who produced them, the conditions under which they were produced, and the lively truth so many of them attain, about the most astonishing things that have ever come from the hands of man.

The adequate illustration of this paper would require reproductions of all the best paintings at Altamira, Font de Gaume and Niaux. This is manifestly impossible. I can but refer readers to various publications wherein reproductions may be found. One small book, *La repertoire de l'art quaternaire*, by S. Reinach, covers almost the whole field, but in bare outlines only. The fine monographs on Cave Art published in France are unfortunately hard to come by. There are, besides the new monograph on Altamira by H. Breuil and H. Obermaier (Madrid 1936); W. J. Sollas, *Ancient Hunters*; H. F. Osborn, *Men of the Old Stone Age*; M. Boule, *Fossil Men*; H. Obermaier, *Fossil Man in Spain*; Mary E. Boyle, *In Search of our Ancestors*; H. G. Spearing, *Childhood of Art*; E. A. Parkyn, *Prehistoric Art*; G. Baldwin Brown, *Art of the Cave-dweller*. These books reproduce nearly all the various works of art which I have had occasion to mention. My own small booklet, *Altamira*, contains a miniature colour reproduction of the Altamira ceiling.

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[19] Many cave-drawings that we now see as bare outline engravings may have been coloured once. If the colours used were pure, that is to say unmixed with melted fat or marrow as a medium, they would last a very short time. In southern Spain, where I live, I tried the experiment of making drawings on a cave wall with fragments of charcoal and red earth picked up off the cave floor. No vestige of these drawings remained after three years. Had I wished them to endure for ever (which heaven forfend) I must needs have taken with me lard and a stove.

Man and Bear in Europe

by Colin Matheson

THE faunal environment of man, as is well known, has profoundly affected his mental as well as his physical life. The Altamira and other animal-drawings made by Palaeolithic man, whether regarded as disinterested efforts at pure art or as magical symbols intended to ensure success in the chase, are sufficient evidence of the extent to which the cave bear, the bison, the mammoth, and other great beasts figured in the minds of their human contemporaries. Professor Othenio Abel considers that Mousterian man associated certain cult-conceptions with the bears he had killed,[1] and kindred ideas are still found in remote parts of the world. Finds of actual bear remains in more or less clear association with human remains or artifacts are of course numerous. Confining ourselves to Great Britain, bones attributed to *Ursus spelaeus* were ' very common ' at Paviland cave, Glamorgan, which yielded also artifacts covering the period from Mousterian to the end of Aurignacian times. Cat's Hole, Long Hole, and Hoyle's Mouth, all in South Wales ; Kent's cavern in Devonshire ; King Arthur's cave in the Wye valley ; Aveline's Hole, Gough's cave, and Wookey Hole in the Mendips ; Ffynnon Beuno cave in the vale of Clwyd ; the Victoria cave in Yorkshire ; Creswell Crags and Langwith cave in Derbyshire ; are other sites which have yielded both remains of bear and human artifacts of various periods.[2]

It is therefore of interest to the student of man as well as the student of animal life to trace in Europe the gradual elimination of this factor, so potent since the earliest times, in human ecology ; until in modern times man in Great Britain and in most parts of Europe, instead of relating wild tales of the strength of the great beasts he tracked across the countryside, has been reduced, in the words of Sir Harry Johnson, to ' twitter on the ferocity of the weasel ', or even, like the inhabitants of Daudet's Tarascon, to practise his skill as a marksman on caps thrown in the air, in the absence of any living game. None of the large mammals provides a better illustration than the bear.

[1] ' The Pleistocene Mammals and their Relations to the Religion of the Palaeolithic Man of Europe ', *Proc. Linn. Soc. London*, 1934–5, pp. 58–70.

[2] Garrod, *The Upper Palaeolithic Age in Britain*, 1927 ; and references therein.

The term ' bear ' in this connexion probably includes two species, usually distinguished as the cave bear, *Ursus spelaeus*, and the brown bear, *Ursus arctos*.[3] With the former however we need not deal at any length, since it died out at a very remote period. The reasons for the extinction of so many big mammalian species about the close of the Pleistocene are still largely unknown, but it seems unlikely that it was due in any great measure to human persecution. In the case of the cave bears, the prevalence of disease is indicated by the many malformed bones that have been excavated. Abel has figured a number of these[4] from Mixnitz, and in the National Museum of Wales we have, for example, several malformed bones of the feet of bears, obtained at Port Eynon cave on the Gower coast of Glamorgan. The liability of various highly specialized types of mammals to disappear in face of a changing environment, in part perhaps because of susceptibility to epizootics of infectious diseases, has been discussed by H. F. Osborn.[5] From whatever causes, the type of bear generally known as cave bear completely disappeared, but not before leaving a deep impression on the mind of Palaeolithic man. Abel refers[6] to the discovery in the Drachenloch cave near Vättis, in the Tamina valley in Switzerland, of several stone chests built by Palaeolithic hunters, each containing four or five bear skulls, most of them with the first two cervical vertebrae attached, and all pointing in the same direction ; as well as fifty-four bear fibulae showing exactly the same orientation. At Petershöhle in southern Germany, and at the Drachenhöhle near Mixnitz in Austria, similar material stated to show evidence of deliberate arrangement by man was unearthed. In Abel's opinion, these three cases represent skull and long-bone sacrifices of Mousterian hunters, which must have been connected with their religious conceptions.

[3] Professor S. H. Reynolds in *British Pleistocene Mammalia*, vol. 2, after a thorough examination of all available British remains of Pleistocene bears, will not commit himself further than to state that the differences separating the cave bear from the others are certainly greater than those between the different bears of the *arctos* type, but, unless perhaps in the case of the fourth premolar tooth, ' it is doubtful whether they are sufficiently marked and constant to afford specific distinctions. Certainly all the species of Pleistocene bears are closely allied and tend to run into one another, and it is perhaps not a matter of much practical importance whether they are grouped as one, two, or three species. On the whole it has seemed most satisfactory to recognise the specific distinction of *U. spelaeus*, while grouping all the other Pleistocene bears as *U. arctos* '.

[4] *Vorzeitliche Lebensspuren*, 1935, pp. 582–93.

[5] *American Naturalist*, 1906, XL.

[6] See footnote 1.

He goes on to comment on the ' most curious fact that, even in present times, ideas of this kind still persist ', for example among tribes in Eastern Siberia and Kamschatka, who hold the skulls of the slain bears in reverence and keep them on scaffoldings built in trees, or in other places, like idols. The bear is believed not to be any the worse from being killed, even if eaten afterwards, if only his skull is severed from the body and properly reverenced. For such reasons the Siberian traveller Pfizenmayer could not obtain a bear's skull from any of the Tunguse tribe, who keep the skulls in boxes of birch-bark or in bundles of brushwood and, like the Aino, fasten them to trees in the forest.[6A]

Abel further states that in southern France there are several representations dating from the Aurignacian period which are certainly pictures of the cave bear, while the later French drawings, attributed to Magdalenian man, depict the brown bear only ; this statement, he tells us, is based on a careful analysis of the characteristics which distinguish the two species, and which have been represented in a surprisingly true manner by the prehistoric artists. From study of these drawings with their erotic symbolism, and of still existing (partly erotic) bear cults in eastern Asia, as described by Hallowell[7] and others, it is, in Abel's opinion, ' almost sure that . . . Man of the Aurignac period as well as Man of the Madeleine period connected religious and cultic conceptions first with the Cave Bear, and, after his extinction, with the Brown Bear . . . also that these ideas have survived, in the same way that the even older religious conceptions of Mousterian Man have survived . . . over an almost inconceivably long period of the history of mankind. . .'[8]

With Professor Abel's interesting suggestions we are here concerned only in so far as the drawings, on which they are based, illustrate the

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[6A] *Siberian Man and Mammoth* (trans. by Muriel D. Simpson) 1939, p. 114.

[7] ' Bear Ceremonialism in the Northern Hemisphere ', *American Anthropologist*, 1926, pp. 1–175. See also Jennison, *Noah's Cargo*, 1928, pp. 189–202.

[8] The association of erotic legends with the bear even among Christian and other peoples where there is no question of ceremonial cults, is remarkably widespread both in space and in time. Thus Edward Topsell, in his *History of Four-footed Beasts and Serpents* (largely a translation of Conrad Gesner's German work of about 1550) informs us that ' a bear is of a most venereous and lustful disposition '; and quotes in detail a case ' most confidently ' told him, of a bear in the mountains of Savoy which carried away a girl to his den for a mate. A precisely similar type of story has been current up to modern times in so distant a region as the Himalayas—' The occasional abduction of women from the villages by bears is firmly believed in ', says Major-General Donald Macintyre in his *Hindu-Koh*, 1889, p. 26.

antiquity of man's preoccupation with the bear. It is known that religious significance attached to the bear at a much later date, and in a different region of Europe. The bear was especially associated with Artemis in Arcadia, and in her worship as Artemis Brauronia at Brauron in Attica. The various accounts of the institution of the latter agree that it was intended to appease the wrath of the goddess, aroused by the killing of a bear. The whole ritual as carried out is believed to have been a reminiscence of earlier times when the goddess herself was a bear. The influence of such old beliefs still survives today, in the names of the constellation Ursa Major and the star Arcturus. In much later times, among the Finns and the Lapps, the bear if not in itself a deity was regarded as under the special protection of a forest god, as Hallowell notes. The ceremonial bear banquet described in the Kalevala is probably not very unlike those actually held among the primitive Finns.

Long after the Aurignacian and Magdalenian hunters, and their Greek successors, had returned to dust, hunters of other races were still pursuing the bear in the mountains and forests of Europe. In Alsace, for example, according to Scherdlin,[9] bears were common in the ninth century in the region of the Vosges, where the Emperor Charlemagne often hunted them, and his son Louis le Debonnaire organized great hunts on four different occasions, the last in A.D. 834. The animal was found not only in the Vosges Mountains but also in the forests of the Alsatian plain. The emperor Henry II about the year 1000 granted to the bishop of Strasbourg, Werinhaire, the exclusive right of hunting the male and the female bear in the great forest in the angle formed by the junction of the Rhine and its tributary the Moder. About the same period the emperor granted a similar concession to the bishop of Bale, Adalberon, for the great forest of the Hardt. In the 12th century Frederick Barbarossa hunted the bear in the forest of Haguenau ; and in the 13th century bears were common around Thann and in the valley of Saint-Amarin.

There are various later records of the bear, some of them recording attacks on human beings. For example, a resident of Kayserberg in 1448 was mauled by a bear which was ravaging a local vineyard, and subsequently died from his injuries. About thirty years later (1475) bears became so daring near the town of Guebwiller that the peasants were forced to abandon their work in the vineyards and fields. Constant persecution gradually drove the bears into remote fastnesses, yet they

[9] ' Animaux disparus de la faune d'Alsace ', *Bulletin de l'Association Philomathique d'Alsace et de Lorraine*, 1924, tome VI, fasc. 6, pp. 303–13.

still appear to have been found in the forest of Neuland, near Colmar, at the beginning of the 16th century. The statutes of the Val d'Orbey for the year 1564 show that the mountaineers of this region enjoyed the right of destroying bears, but that the head and the four paws had to be presented to the Seigneurie. About this time the town of Münster was in the habit of sending bear hams, accompanied by the cheese of the district, to people of note. As late as 1621 several communities in the valley of the Thour presented to the Austrian Regency at Ensisheim an account of the injuries they had suffered from the ravages of bears in their fields and vines; the archduke Leopold authorized them to undertake a hunt for bears and wolves, but refused the right to destroy wild boars, which he reserved for himself. By the 17th century the bear, owing to constant persecution, had become uncommon in the northern Vosges. Nevertheless one huge specimen was killed in 1675 in the forest of Barr, close to Hohwald; the magistrate of Strasbourg who was seigneur of Barr ordered that the hunter who had delivered the district from this menace should be paid a fee of three thalers instead of two, which was the usual figure, because of the enormous size of the beast. There is a record of another killed close to Andlau in 1695.

At the beginning of the 18th century the bear, though still numbered among the animals of Alsace, was becoming very rare. One of the last specimens on the western flanks of the Vosges was killed in the forest of Bussang in 1709. On the eastern side of the range the animal survived rather longer, there being, for example, records of about half a dozen killed in one valley between 1725 and 1755. What is said to have been 'the last bear in Alsace' was killed about 1760 in the valley of Münster, by some mountaineers who had discovered its den among the rocks of the Baerenfels; though there is a record (considered very doubtful) of a 'last bear' killed near Guebwiller a few years before the Revolution.

Scherdlin quotes many Alsatian place-names as reminders of the former presence of the bear. Such are various places named Baerenbach, Baerenberg, Baerenfels, Baerenthal, and several others. Probably the local name for the bear is embodied in place-names in many parts of Europe; it has been suggested, for example, that in Wales, where the bear was probably extinct before the 9th century, the name Arthog in Merionethshire is derived from the Welsh *arth*, a bear. Several plant-names in the Alsatian dialect are also thought to have originated in the time when bears figured largely in the district, e.g. Baermutter

for *Meum athamanticum*, Baerlapp (*Lycopodium clavatum*), Baerebrot (the fruits of *Viburnum lantana*).

In and around the Alpes–Maritimes there are also various early records of the brown bear.[10] Statutes of the Marquis of Saluces issued in the 13th century laid down the procedure to be followed by the inhabitants of the valley of the Stura (a tributary of the Po) with regard to bears killed in their district, either by themselves or by strangers. The animal was still to be found at the close of the 18th century, and there is a record of one taken in a trap and killed on 17 November 1780. By this time however it must have been getting rare, for according to Risso's work (published in the 'twenties of last century) on the natural history of southern Europe, as quoted by Caziot, ' L'apparition des ours dans notre région est si rare, les moyens que l'on emploie pour les chasser sont si prompts, qu'ils ne peuvent plus se propager '.

Further west in southern France, a few bears are said still to linger in the Pyrenean districts, in the forests of the department of Ariège.[11]

The former abundance of the bear in parts of Germany is shown by the fact that John-George I, elector of Saxony, killed, either personally or along with members of his court, 238 bears between 1611 and 1656; while his son John-George II accounted for another 239 between 1656 and 1680.[12] The sumptuously-bound game diaries of John-George I, recording in detail his vast bags of deer, bears, wolves, beavers, and other animals, have survived until modern times, and are of considerable interest to the zoologist as well as to the sportsman.

There are numerous old records of the bear in parts of Switzerland.[13] Thus in the canton of Fribourg during the 16th century, fees varying between 3 and 6 livres were paid for killing adult bears and 1 to 2 livres for young ones. The indigenous stock in this area is stated to have died out about the close of the 17th century, the last record of payment in the canton being for a bear killed in the commune of Barbereche in 1698. In other Swiss districts where bears are now extinct there are records as late as the first half of the 19th century.

As regards Great Britain, Harting gives evidence to indicate that

[10] Caziot, ' L'Ours, brun dans les Alpes-Maritimes ', *Annales de la Société Linnéenne de Lyon*, 1920, LXV, 33–35.

[11] Feuillée-Billot, *La Nature*, 1932, II, 551–56.

[12] Barclay, *Big Game Shooting Records*, 1932, p. 164.

[13] *Bulletin de la Société Fribourgeoise des Sciences Naturelles, Compte-Rendu* 1893–7, VII, 60–82.

the brown bear was still to be found in the 9th century of the Christian era, but it is believed that even in the wilds of Scotland it became extinct before the Normans landed on our shores.[14]

At the present day the main haunts of the brown bear are stated to be in Russia, Scandinavia, and the Balkans, though it occurs in small numbers in Spain and elsewhere ; in Poland, for example, according to official statistics, the national forests in 1929 were estimated to contain 141 brown bears.[15]

Bear-hunting is a favourite form of sport in those districts where the species still occurs in appreciable numbers. In northern Europe a Finnish officer, Major Berndt Höök, who died about 1903, shot at least 100 bears during his hunting career, mostly in Russian Karelia, and was present at the death of at least double that number. Two other hunters, Falk and Lloyd, shooting almost wholly in Scandinavia in modern times, each accounted for about 100 bears. The record bag of bears made by driving was in Sweden in 1856 ; 4000 men formed a driving line which, with the wings, was over 60 kilometres long, and the three-day drive resulted in a bag of 23 bears, 9 elk, 3 wolves and 1 lynx.

In Transylvania a party of 10 or 12 guns secured 28 bears in three weeks, and in the same season another party had a bag of 22 bears.

In the Kouban game preserves of the grand duke Sergius of Russia, in the Caucasus, bears were treated as vermin, and it is stated that towards the close of the 19th century his huntsman shot on an average about 80 bears a year.[16]

In addition to providing sport for the hunter, the bear was for long the unhappy victim of ' sports ' of a much less attractive kind. In Roman times bears were commonly used in the public shows, at Rome and elsewhere. Under Caligula a *venatio* was given in which 400 bears figured, and in the first year of the reign of Claudius there was a *venatio* of 300 bears and as many animals of other species. In the reign of Nero, cavalry of the Praetorian Guard had to engage with 400 bears and 300 lions. The emperor Commodus is described by Dio as killing 100 bears in one day ; and towards the end of the reign of Septimius Severus, the nobleman Cordian gave during his aedileship shows in which 1000 bears were exhibited. Not all of these animals necessarily came from Europe, there being reasons for thinking that Asia and Africa may have contributed, as was certainly the case with

[14] *British Animals Extinct within Historic Times*, 1880, pp. 11–32.

[15] *Journal of Mammalogy*, 1930, p. 508.

[16] Barclay, op. cit. pp. 224–7.

various other species ; but no doubt European specimens formed a large proportion. Various contemporary writers speak of bears being imported for the shows from Lucania, Apulia, and Dalmatia, and even from as far afield as Scotland.[17]

In medieval times the Roman bear-shows were replaced by the equally regrettable pastime of bear-baiting, which in England for example was popular for about 700 years, and was not actually prohibited by law until 1835. Macaulay's gibe at the Puritans for their efforts to prohibit bear-baiting, not because it gave pain to the bear but because it gave pleasure to the spectators, is well-known ; and bear-baiting is dealt with so extensively in various works that we need not go into details here.

A more pleasant side of the relationship between man and bear is seen in the following quotation from Freshfield's *Exploration of the Caucasus*[18]—' The rest of the day was given over to sports on the green . . . various games were played, the women danced, and the boys tumbled about with some young bears which had been caught in the forests '.

The pelt of the bear furnished warm clothing for primitive man, and today is still of considerable commercial value and is used in the making of robes and rugs as well as of collars, borders for garments, and headgear. Even in the middle of the last war, when it may well be that the numbers available were relatively low, 300 bear skins were offered for sale at the great annual fair held at Irbit in the Urals, in July 1917. Bear's grease was once regarded as a hair-oil of particular value because it was believed to make the hair grow ; it ceased to be so popular some time in the latter half of the 19th century, ' for good and sufficient reasons—the scarcity of fat bears, and the fact revealed by analysis that nearly all bears oil sold at a fairly high price had other than a bear origin '.[19] The flesh has been used as food in Europe as in other parts of the world—the Alsatian bear hams have already been mentioned ; and the inclusion of the bear along with stag, hare, and wild boar as providing the ' four chief venison ', in the old Welsh text *Y Naw Helwriaeth*, may at any rate be regarded as suggesting the popularity of this article of diet in some parts of Europe in early times.

[17] Jennison, *Animals for Show and Pleasure in Ancient Rome*, 1937 ; and references therein.

[18] Second edition, 1902, vol. 1, p. 252.

[19] Belden, *The Fur Trade of America*, 1917, pp. 444, 502.

Samuel Pepys, quoting information he had received about the country round Königsberg, observes in his Diary under date 11 December 1663, 'Young beares appear there; their flesh sold in market, as ordinarily as beef here, and is excellent sweet meat'.

Over practically the whole of Europe, as already observed, the only bear found for thousands of years past has been the brown bear. But along the extreme northern fringes of the continent, within the Arctic Circle, hunters and whalers have come in contact with another species, the polar bear, which occurs in the arctic regions of both hemispheres. In Novaya Zemlya it is stated still to be found, though rare in the south of the island, and its numbers have probably decreased considerably since the extension northward of whaling, hunting and settlement by various European nations; just as has happened in North America (where, however, owing to the different climatic conditions, it extended much further south). Norwegian walrus-hunters sailing from Tromsö brought back, in the four years 1868–71, 245 skins of polar bears.[20] The relatively high price fetched by their fine skins provides a considerable incentive to the destruction of the polar bears; at an auction in New York in 1928 the prices obtained ranged from 19 to 38 dollars, as against a maximum of $15\frac{3}{4}$ dollars for skins of any other species of bear.[21]

The bear as a significant factor in the lives of the vast majority of Europeans has long since disappeared; as reminders of its former influence we have a few such familiar phrases as we use when talking of licking someone into shape; a few surnames in various languages, such as Björnson, son of the bear; and the name applied to the constellation that shines down on us from the night sky.

[20] Lydekker, *Royal Natural History*, 1894, vol. 2, p. 5, quoting Nordenskiöld.

[21] Henderson and Craig, *Economic Mammalogy*, 1932, p. 59.

The Kivik Cairn, Scania

by L. V. Grinsell

THE incised slabs of the rectangular cist in the cairn at Kivik rank with the Hagia Triada sarcophagus in being among the most important discoveries so far made of evidence bearing on the funeral rites of the Bronze Age in Europe, and it seems certain that pending further discoveries these two monuments form the foundation on which our study of Bronze Age funeral customs must be built.

Before discussing the Kivik cairn itself it is well to glance at the archaeological setting of Kivik and the surrounding country, for on this the correct interpretation of the Kivik slabs depends.

It is well known that Scania is the richest province in Sweden for Neolithic and Bronze Age implements, more than twice as many of both kinds having been found there as in all the rest of Sweden.[1] This wealth of prehistoric material is however shared by the neighbouring parts of Denmark and Zeeland. To what extent this flowering of Neolithic and Bronze Age culture was a native development, and to what extent it was due to influence from southeastern Europe, it is not our place here to inquire. It is enough to point out that, according to Childe,[2] ' the amber deposits of Jutland are a magnet which must have attracted adventurous mariners to the inhospitable shores of Scandinavia ', and the so-called amber routes connected this region with the Aegean. It may be added that Scania contains a large number of Bronze Age barrows, and several Bronze Age rock carvings both on exposed rock surfaces and in barrows.[3]

The fishing village of Kivik is situated on the eastern coast of Scania, about nine miles north of the holiday resort of Simrishamn (FIG. 1). The soil of the locality is a gneiss-granite, giving rise to a healthy vegetation, and forming a ridge from northwest to southeast, known as Linderöds åsen, varying in height between 300 and 600 feet. On a stretch of this heathland within 300 yards of the coast, and on the

[1] This fact was well illustrated by Montelius in his table of finds on p. 512 of *Report of Stockholm Congress*, 1874.

[2] *Dawn of European Civilisation*, 1927, p. 204.

[3] Listed in Almgren, *Hällristningar och Kultbruk*, 1927, p. 321.

THE ENVIRONS OF KIVIK, SCANIA.

FIG. 1

northern slope of the eminence called Stenshufvud (the stone headland) south of Kivik village, is the celebrated cairn (FIG. 2), surrounded by about 20 smaller examples in a dilapidated condition, the whole group being known locally as Kungagraven (the Kings' Graves).[4]

The large cairn which contained the incised cist-slabs is about 75 yards in diameter,[5]—much larger than most Bronze Age barrows. For many years the stones of the cairn were quarried for material for building bridges, houses, walls, etc., in the vicinity, and some of the stones of this prehistoric sepulchre were even used as modern tombstones,[6]—a fact which might well have called forth a pious reflection from Sir Thomas Browne had he been able to include it in his *Urne Buriall* (1658).

The cairn and cists have recently (since 1930) been restored as nearly as possible to their original condition, at a cost of about 40,000 kroner, the funds having been supplied from Crown Prince Gustav Adolf's Fund for the Care of Swedish Cultural Monuments, which was founded to mark the tercentenary of the Royal Literary Historical and Antiquarian Academy of Stockholm. The work was directed by Gustav Hallstrom and J. E. Forssander, and consisted of reconditioning the stone cist formed of incised slabs, supplying a protective concrete covering and suitable means of access, and restoring the cairn nearly to its original size and shape.[7]

It was in August 1748 that workmen quarrying from the cairn discovered a rectangular stone cist about 13 feet long and three feet wide, placed north and south. It was composed of flat granite slabs, four on each of the long sides and one at each end. Each slab was about 4 feet high, 3 feet wide, and 8–10 inches thick. The whole was roofed with three capstones.[8] The floor of the cist appears to have been level with the ground on which the cairn was built.

Montelius showed many years ago that cists of this shape and size appeared in south Scandinavia at the end of the Neolithic period and

[4] About two miles south of Kivik is the Villfara stone, which has carvings similar to some of those at Kivik, and was probably removed from a cairn nearby to its present situation on the boundary of the parishes of Vallby and Tommarp.

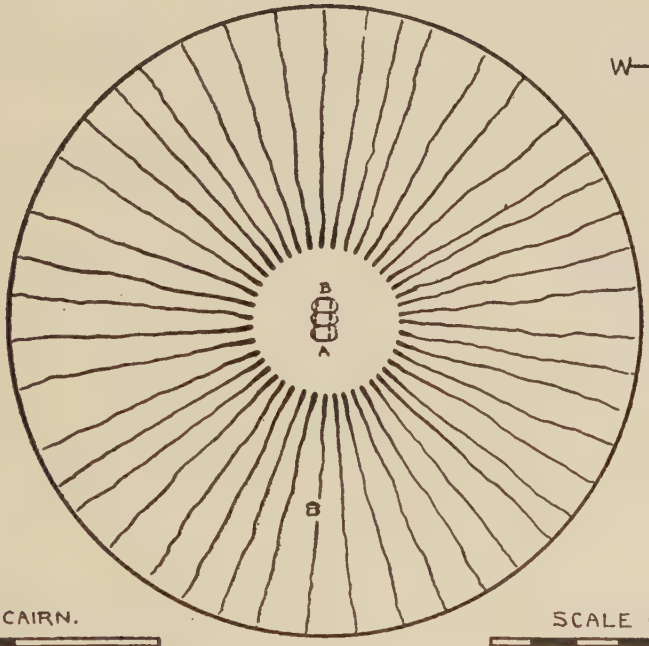
[5] Du Chaillu, *The Viking Age*, 1889, I, pp. 86, 89.

[6] Hoernes-Menghin, *Urgeschichte*, 1925, p. 240.

[7] *Fornvännen*, 1938, pp. 3–6.

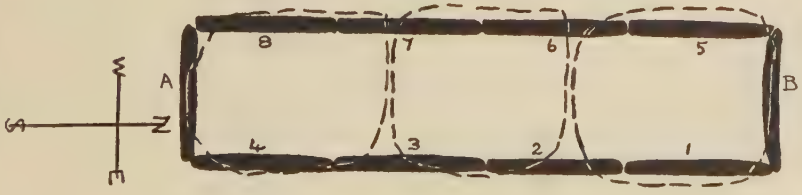
[8] The Kivik cairn also contained a smaller cist south of the other, 4 ft. long with two capstones, but the slabs were quite plain. Simpson, *Archaic Sculpturings*, 1867, p. 84; Hoernes-Menghin, *Urgeschichte*, 1925, p. 240.

THE KIVIK CAIRN.



SCALE OF CAIRN.
0 50 100 FEET

SCALE OF CIST.
0 2 4 6 FEET



L. V. Grinsell 1941

FIG. 2

continued through the Bronze Age, but after cremation was introduced the size of the cists tended to get smaller.[9] The large size of the present example suggests a date early in the Bronze Age, and this is supported by the types of axe and lurer depicted on slabs 1 and 8 described below. It is supported also by the fact that the neighbouring barrow of Villfara, from which almost certainly came a stone with similar carvings, yielded some implements dating from the Early Bronze Age when excavated by S. Nilsson.[10]

The capstones and endstones at Kivik were, so far as we know, without any ornament, but of the eight side-slabs seven were incised with the celebrated pictures which, if only we could be sure of interpreting them correctly, would throw a great deal of light on the funeral customs of the Bronze Age. The pictures on the slabs appear to represent the funeral rites of the deceased, and it will be best to describe them in the order in which they have been numbered by the best authorities.

Slab 1 (FIG. 3, 1) has been lost for many years,[11] and unfortunately although several drawings are extant they differ in detail. All agree however in showing one hafted axe on each side of an obelisk, and the axe drawn belongs to a well known type of Bronze Age implement referred by Brøndsted[12] to 1000–800 B.C. The obelisk is shown as slender on Hilfeling's drawing (1780) but is much broader in Broocman's drawing[13] and in those reproduced by Nilsson and Simpson.[14] Beneath the base of the obelisk all the drawings agree in showing what looks like either a boat or a sledge. Between the obelisk and each axe the drawings show a long slender object of uncertain shape and purpose. Hilfeling, followed by Nilsson and Simpson, shows them finely tapered at each end; Broocman shows them as poles supporting the axes; and Kossinna's reproduction[15] shows them as lance- or spear-heads.

Slab 2 (FIG. 3, 2), was drawn rather inadequately by Hilfeling but later drawings based on close study of the slab show that it portrays a

[9] *Les Temps Préhistorique en Suede*, 1895, pp. 33, 127.

[10] Montelius, *Report of Stockholm Congress*, 1874, p. 471, note 1.

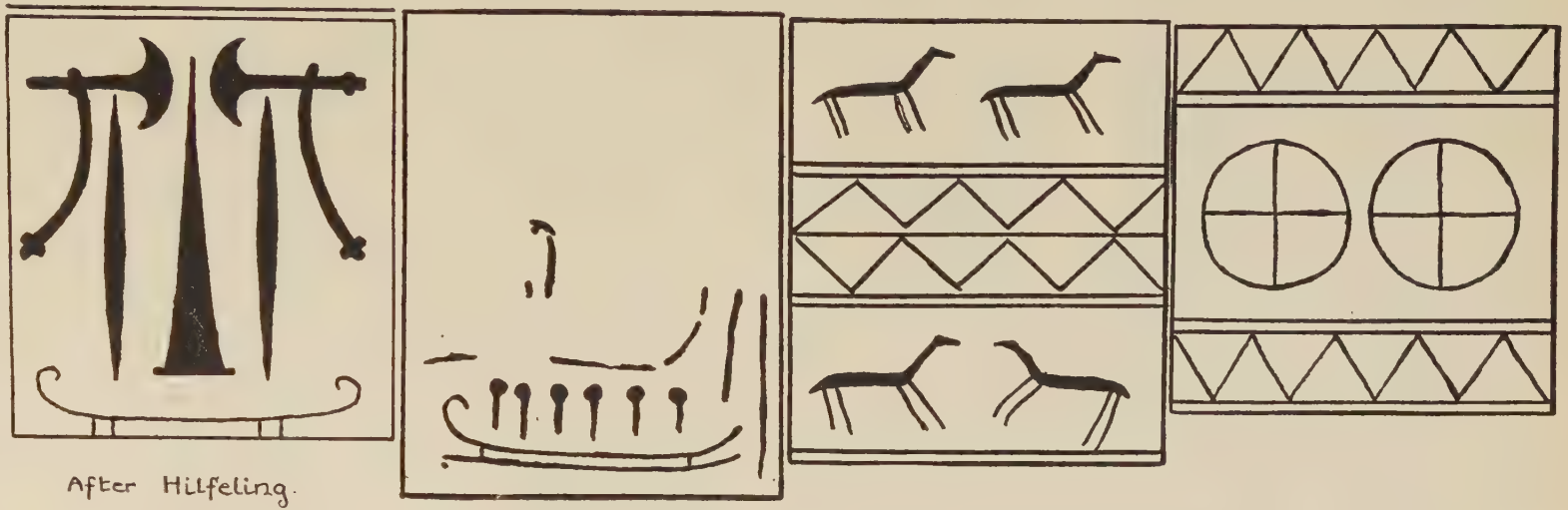
[11] It is believed to have been built into the chimney of a neighbouring cottage. Almgren, op. cit. 171–5.

[12] Brøndsted, *Danmarks Oldtid*, 1939, II, p. 99, fig. 88.

[13] Almgren, op. cit., fig. 114.

[14] Sir J. Y. Simpson, op. cit., pl. XXXII.

[15] *Die Deutsche Vorgeschichte*, 4th ed., 1925, fig. 204, p. 90.



THE KIVIK CAIRN: DESIGNS ON FIRST FOUR CIST-SLABS.

FIG. 3

boat with a crew of six. According to Norden[16] there may be the remains of another boat symbol above this, perhaps a repetition in order to increase the magic potency, but the slab surface is in a state of disintegration.

Slab 3 (FIG. 3, 2), consists of an upper and lower portion divided by a double zigzag frieze. In the upper portion are two horses facing to the right of the reader and in the lower portion are two horses facing one another.

Slab 4 (FIG. 3, 4) has an upper and lower frieze of zigzag ornament similar to the last, and between these two friezes are two wheeled crosses generally accepted as solar emblems.

Slab 5 contains no design.

Slab 6 (PLATES I and II) consists of an upper and a lower part. The upper part contains two crescent-shaped designs with double scrolls, supposed by Bing to be moon emblems and by Norden to be axes. The lower part, which is separated from the upper by a single line, consists of two wheeled crosses, probably sun emblems and identical with those on slab 4.

Slab 7 (PLATE II, left) is ornamented in three rows. The upper row consists of a chariot with two wheels drawn by two horses with a man at the helm steering the horses with reins fixed to their nozzles. In front of these is a man (with a spear or stick ?) following three people whose arms are invisible and probably tied behind their backs. These figures may represent prisoners of war but it seems more likely that they are captives about to be sacrificed. The middle row contains two horses who look as if they have been killed, perhaps for the funeral feast or to be sacrificed on the pyre. In the same row is what appears to be a large fish. The lower row contains eight remarkable figures clad in long robes with their hoods formed like the heads of birds, and in front of these is a man waving his hands in the air, and probably holding a squarish object in his right hand.

Slab 8 (FIG. 4), is likewise ornamented in three rows. In the first row are people with musical instruments. The first two figures are men playing lurer, a type of Scandinavian sacred musical instrument well known in the Bronze Age, and always found in pairs. They are scaled on the three-note system and are thinly walled. There are 36 well known examples.[17] The Kivik slab shows the type that was in use

[16] Quoted in Almgren, op. cit., 1927, pp. 171–2.

[17] H. Kuhn, *Die Vorgeschichtliche Kunst Deutschlands*, 1935, p. 90.

1000–800 B.C., and this agrees with the date of the axes on slab 1.[18] The third figure appears to be carrying in his right hand a squarish object similar to that carried by the figure in the lower row of slab 7, perhaps a rattle akin to those used nowadays by football enthusiasts. The fourth figure wears a skirt and appears to be dancing, or perhaps holding the remarkable instrument played by figures 5 and 6. This is an

FIG. 4. KIVIK: SLAB 8

enormous hoop-shaped instrument with a straight piece projecting upwards from the middle. From the top of this straight piece is suspended a horseshoe-shaped bar terminating with a circular disc at each end, one of which is being struck by each of figures 5 and 6. It appears to be a double percussion instrument, but Bing and Almgren think it may be a fire-boring instrument (*Hällristningar*, 1927, 171–5).

[18] For lurer (plural of lure) see Brøndsted, op. cit., II, 115 f, 169 f, 186 f, 220 f, 271, 286, 291 f; also Shetelig, Falk, and Gordon, *Scandinavian Archaeology*, 1937, p. 138.

The second row contains a rearrangement of the weird figures in long robes and bird-like hoods which occur in slab 7. On slab 8 they appear four on each side of a central stand which is probably either an altar or a cauldron, which they all face.[19] In the lower row we see captives similar to those in slab 7, likewise in the care of a man with a spear or stick. These four figures occur twice in slab 8, each time as if three of them are being led into a kind of cage shaped like a reversed C by the fourth, who appears to be their keeper.

Comparative Study

We now come to the task of finding parallels to the various subjects displayed on the Kivik slabs.

The axes of slab 1 may be compared with the Bronze Age axes, generally hafted, frequently met with in Bronze Age rock-carvings both on exposed rock surfaces and on sepulchral slabs. As an example of the former we may note those from the carvings at Simrislund also in Scania, and wheeled crosses and boats occur on the same slab.[20] Hafted or unhafted axes occur on a sepulchral slab from Simferopol, Crimea,[21] on various sepulchral slabs in Brittany,[22] on one from the Badbury barrow in Dorset,[23] and on a slab from an Early Bronze Age cist at Ri Cruin, Argyll.[24] The presence of two hafted axes facing one another above a possible boat on Kivik slab 1 is paralleled by an open rock-carving at Sotorp near Tanum, Bohuslän, where two hafted axes with cutting edges facing one another are fixed on top of a boat.[25] These axes are almost certainly identical with the hollow-cast ceremonial axes found in pairs at Skogstorp in Södermanland and at Brøndsted in Jellinge. Cast with only a thin covering of bronze over a clay core they are decorated in part with gold, and as they are clearly useless for practical purposes they must have been symbolic or religious.[26]

[19] There is some doubt on this point. Drawings by Hilfeling and others show four figures on each side of the central object, but the latest photographs of the restored slab (which was broken and some parts lost) show three (possibly four ?) on one side and five on the other. See Brøndsted, op. cit., 1939, p. 106.

[20] Almgren, op. cit., fig. 96.

[21] *Eurasia Septentrionalis Antiqua*, 1934, IX, 44, fig. 35.

[22] Péquart and le Rouzic, *Corpus des Signes Gravés*, 1927, passim.

[23] S. Piggott in *Antiquaries Journal*, 1939, XIX, 291–9.

[24] *Proc. Soc. Ant. Scot.*, 1930, LXIV, 131–4.

[25] Almgren, op. cit., fig. 13a.

[26] Shetelig, Falk and Gordon, op. cit., 156.

PLATE I

THE KIVIK CAIRN AS DRAWN BY HILFELING, 1780 (*see* p. 164)
Ph. The Bodleian, Oxford

facing p. 168

PLATE II

KIVIK: SLAB 6 (*see* p. 166)

PLATE III

KIVIK; SLABS 6 (right) AND 7 (left), *see* p. 166

EARLY MEDIEVAL GRAVE STONE AT HORNHAUSEN, SAXONY (*see* p. 175)

The obelisk of slab 1 is not unlike those crowned with double axes on the Bronze Age sarcophagus of Hagia Triada, even to the detail of being placed on a plinth. Furthermore the presence of an obelisk above a boat occurs not only at Kivik but also in a temple of Amon.[27]

The boat (with the possible remains of another) on slab 2 may be paralleled by the three boats on the Villfara slab two miles south of Kivik. There are also three boats, accompanied by sun symbols, on the capstone of a burial chamber at Herrestrup in Zeeland, and there is another boat on a capstone of a burial chamber at Kirke Stillinge, Sorø, also in Zeeland, mentioned by Brøndsted who gives a map of the distribution of rock-carvings of ships, sun-symbols, and other subjects in Denmark.[28] In the Morbihan is a sepulchral slab with probable boats at Mané Lud, and possible examples elsewhere,[29] and in Ireland at New Grange is a slab with possible boat and sun-symbol.[30] The sarcophagus of Hagia Triada in Crete contains a painting of a boat being offered to the dead, and examples from Egypt are too well known to need quoting.

The zigzag ornament on slabs 3 and 4 is a common motive in the Bronze Age decoration of Central Europe.

Drawings of horses, as on slab 3, often appear on exposed rock carvings, and at Tanum, Brastad and elsewhere in Bohuslän and other provinces they are shown towing sun emblems in the manner of the famous sun chariot of Trundholm Moss, Zeeland. Bing and others consider that the horses facing one another on either or both of slabs 3 and 7 are in the attitude of contest, following which they were sacrificed and their blood poured into the probable cauldron in the centre of slab 8.

The wheeled crosses of slabs 4 and 6 are very common in south Scandinavia among the Bronze Age rock carvings, and they are clearly intended generally to be sun emblems. They are very numerous in Bohuslän and elsewhere, where they are often associated with boat carvings. Wheeled crosses and boat carvings occur together on the capstone of a burial chamber at Herrestrup in Zeeland, and there are one or two possible examples in Brittany. Although it seems generally

[27] Almgren, op. cit., 44.

[28] Brøndsted, op. cit., II, figs. 120, 131.

[29] Péquart and le Rouzic, *Corpus des Signes Gravés*, 1927, 61–6, pl. 44.

[30] G. T. Flom, ' Figures of Ships and the Four Spoked Wheel in Ancient Irish Sculpture ', in *American Anthropologist*, 1923, XXV; G. Coffey, *New Grange*, 1912, passim.

safe to interpret single wheeled crosses as sun emblems, a glance at slab 7 shows that the same symbol has been used for the wheels of a sacred chariot, and it has been suggested that it may have been a sun chariot. The Villfara stone shows a similar chariot with four-spoke wheels, and the exposed rock carvings of Bohuslän, Scania (e.g. Frannarp) and elsewhere show similar examples. Similar chariots, but with four instead of two wheels, appear on decorated funeral urns from Darslub (West Prussia) and Odenburg (Hungary),[31] but these belong to the Early Iron Age. A chariot with four-spoke wheels is depicted on each of the two small sides of the Hagia Triada sarcophagus. These and other Bronze Age chariots have been the subject of a paper by R. Forrer.[32]

The naturalistic representations of figures of slabs 7 and 8 are rare on sepulchral slabs of Bronze Age, but three similar figures, two of them with arms raised and one with outstretched fingers, occur on a cist-slab from a Bronze Age barrow at Anderlingen in Hanover.[33]

In regard to the apparent fish in the middle row of slab 7, the situation of the cairn within 300 yards of the sea should be remembered.

The playing of musical instruments (slab 8) is depicted also on the Hagia Triada sarcophagus, and on exposed rock carvings near Tanum, Bohuslän.[34]

Perhaps the most puzzling of all the subjects represented on the Kivik slabs are the eight weird figures on slabs 7 and 8. One may search in vain among the Bronze Age carvings of Scandinavia for similar figures, although one was illustrated by Montelius in 1874.[35] V. Severin has recently compared them with a terracotta Classical figure about 600 B.C. in a museum at Lund, but the validity of the comparison is doubtful.[36] It has been plausibly suggested that the figures represent mourners in disguise so that they will not be recognized or molested by the ghost of deceased.[37] On slab 7 they are all together, while on slab 8 they are arranged four on each side[38] of a tub-shaped object variously interpreted as a coffin, an altar, or a cauldron

[31] Hoernes-Menghin, *Urgeschichte*, 1925, pp. 531, 559.

[32] ' Les Chars Cultuels Préhistoriques ', in *Préhistoire*, 1932–3, pp. 19–123.

[33] Kossinna, *Deutsche Vorgeschichte*, 4th ed., 1925, pl. XXI.

[34] Almgren, op. cit., figs, 7, 14.

[35] *Report of Stockholm Congress*, 1874, p. 462, fig. 18.

[36] *Fornvännen*, 1932, pp. 378–81.

[37] Bernhard Salin, in *Fornvännen*, 1921, pp. 207 f.

[38] But see note 18 above.

or krater. In shape it is not unlike the krater into which libations are being poured at Hagia Triada. The long robes of the eight figures are likewise paralleled by the long dresses worn by some of the women in the Hagia Triada procession.

The reversed C shapes on slab 8 appear to be unique in the realms of Bronze Age design.

Interpretation

M. P. Nilsson's statement in regard to the Hagia Triada sarcophagus may well be applied to Kivik; the pictures decorate a tomb, ' hence the natural view adopted by most scholars that they refer to the man laid in it, his cult, and the after life. This is the invariable characteristic of pictures and sculptures found in tombs '.[39] To what extent the drawings on a tomb relate to the life, the funeral rites, or the future life of deceased, can be determined only by a close study of each pictorial sepulchre. Many years' study of the exposed and sepulchral rock-carvings of Scandinavia have led Professor Almgren to conclude that the engravings on the Scandinavian Bronze Age sepulchral slabs ' have without any doubt been intended to facilitate the life beyond the grave '.[40] As the funeral rites themselves are largely concerned with this object they would presumably be included in his interpretation.

Professor S. Nilsson suggested many years ago that some of the Kivik carvings represented ' a victory, or rather the rejoicings and human sacrifices following it '.[41] With this view I am unable to agree.

There can be little doubt that the balance of opinion strongly favours the view that the pictures on the Kivik slabs refer to the funeral and future life of deceased, and this is the standpoint adopted by the writer in this paper.

The hafted axes drawn on slab 1 probably represent sacred axes, but whether symbolical of the importance of deceased, or of the implements used at the funeral sacrifices, it is difficult to say.

The central obelisk has already been compared with the Mycenaean examples on which double-axes were mounted, and probably had some sacred significance.

There can be no reasonable doubt that the boats on slabs 1 and 2 and the wheeled crosses on slabs 4 and 6 are intended to convey the idea of the boat of the sun used to convey the dead on his last voyage,

[39] *The Minoan-Mycenaean Religion*, 1927, p. 373.

[40] Almgren, op. cit., 327.

[41] Quoted in Simpson, op. cit., 1867, pp. 84–90.

and this view is supported by the association of boats with sun emblems of the wheeled cross type at Herrestrup in Zeeland, and on certain other rock-carvings, both sepulchral and on exposed surfaces, in south Scandinavia and elsewhere. The idea involved may well have been derived ultimately from Egypt, either from the Aegean and Central Europe, or the Mediterranean and the North Sea.

The presence of two pairs of sun emblems, one on the eastern side and the other on the western side of the cist, may perhaps have been intended to symbolize the boat and chariot of the rising sun and those of the setting sun ; but then why only one chariot, and why two boats both on the eastern side of the cist ? Almgren considers that the duplication of the pairs of sun emblems was done to increase the magic potency of the symbols.[42]

The four horses on slab 3 reappear on slab 7, the two facing one another, having apparently been killed for sacrifice, and the other two being used to draw the two-wheeled chariot.

In this way the dead was provided with facilities for pursuing his journey to the future life both by sea and by land and the drawings in the middle row of slab 7 were perhaps intended to provide him with fish during his sea voyage and animals during his journey over land.

The human captives on slabs 7 and 8 were doubtless for the dual purpose of being sacrificed in his honour and functioning as his slaves.

The weird figures to slabs 7 and 8 are almost certainly either priests in sacred costume, or (more probably) mourners disguised in female attire in order to prevent their being subsequently molested by the ghost of the deceased. On slab 8 they are arranged on each side of what may well be a sacrificial cauldron[43] or bowl similar to the krater depicted on the Hagia Triada sarcophagus. Almgren[44] suggests that this may be a wooden tub.

An interesting feature of slabs 7 and 8 is that whereas in slab 7 the whole procession is on the move, in slab 8 it is stationary and the ceremony has evidently reached its climax.

It is difficult to determine whether the music of slab 8 was to drown the shrieks of those being sacrificed, to frighten away the ghost of the deceased, to soothe the dead on his last journey, or to add to the impressiveness of the funeral.

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[42] Almgren, op. cit., 172.

[43] As suggested by H. Kuhn who calls it a Kultkessel (*Die Vorgeschichtliche Kunst Deutschlands*, 1935, p. 90).

[44] Almgren, op. cit., 174.

In all his writings on primitive funeral customs the late Sir James G. Frazer emphasized the great part played by the fear of the dead,[45] and with this in mind I suggest that the Kivik pictures had the two-fold object of securing a comfortable passage for the dead during his last journey, and preventing him from returning to molest the living.

We may conclude by emphasizing the resemblances between the Kivik sculptures and the Hagia Triada sarcophagus, tabulated on p. 174; and as Kivik is known to be later in date we are entitled to consider to what extent the ideas embodied at Kivik were due to influence from the Aegean and to what extent they were native. The chief differences of Kivik from Hagia Triada are :—

(1) the more naturalistic style of H. Triada, the Kivik carvings being so conventionalized as to suggest derivation from a more naturalistic original ;

(2) the typically Cretan harp is replaced by the typically Nordic lurer at Kivik ;

(3) the tree-worship of H. Triada and the Aegean finds no place at Kivik, although drawings of trees occur in the Bronze Age carvings of Bohuslän ;[46]

(4) while sun-worship was of minor importance in the Aegean and does not appear at all at H. Triada, it was very important at Kivik and in the rest of Scandinavia during the Bronze Age.

Indeed the resemblances between the Hagia Triada sarcophagus and the Kivik carvings are so striking that the ideas embodied in the latter may well have sprung either directly or indirectly from the Aegean, while the differences, which are of equal interest, can be explained by the observation of Almgren[47] that ' at Kivik most of the elements become so-to-speak translated into the dialect of the Nordic Bronze Age religion '.

I am indebted to the Secretary of the Royal Geographical Society for access to large scale maps of the Kivik area, on which my map is based ; to Mrs Naftel for help in translating the German accounts of the monument ; and to the Bodleian Library for the illustration reproduced at plate I.

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[45] e.g. *Fear of the Dead in Primitive Religion*, 1933–6, passim.

[46] Almgren, op. cit., figs. 5, 66.

[47] loc. cit. p. 170.

HAGIA TRIADA AND KIVIK COMPARED

Hagia Triada	*Kivik*
1. Boat offered to the dead	1. Boats on slabs 1 and 2
2. Two (? sheep) offered to the dead	2. Two animals lying prostrate on slab 7
3. Seven-stringed harp played by youth, and double flute played above sacrificed bull	3. Two people playing lurer on slab 8, and two people playing double tympanum (?) on slab 8
4. Blood (?) being poured from small vessels into two-handled krater	4. Object looking like two-handled krater with four figures on each side on slab 8
5. Procession of about 8 people on one of the long sides	5. Procession of 8 people curiously clad on slabs 7 and 8
6. Sacrifice of bull and two goats on one long side	6. Sacrifice (?) of two horses on slab 7, and possible sacrifice of 3 or 6 slaves on slab 8
7. Chariots on both short sides, each with two wheels with four spokes, drawn in one case by horses, in the other by griffins	7. Chariot with two four-spoked wheels drawn by two horses and rider on slab 7
8. Double axes on both long sides, mounted on thin pyramid or obelisk	8. Thin pyramid or obelisk with EBA sacred axe on each side
9. No sun emblems	9. Sun emblems on slabs 4 and 6

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Notes and News

THE SCULPTURED STONES AT HORNHAUSEN

The review of Mrs Cecil L. Curle's article on the Early Christian Monuments of Scotland,[1] in the March number of ANTIQUITY, affords a convenient occasion to draw attention to an isolated group of similar sculptures found at Hornhausen. The most important was discovered in 1874 on the Salberg, the site of a small medieval chapel east of the village.[2] This and other chance finds led to trial excavations carried out in 1914. These proved that the sculptures in question were associated with two inhumation graves which were clearly earlier than a small cemetery belonging to the medieval chapel. The two early graves had contained burials in wooden coffins, one associated with an iron knife of a type not closely datable.

The most important of the sculptures is a slab 26 inches wide by 32 inches high, broken at the top and bottom (PLATE facing p. 169). The back and sides are dressed but this is not necessarily an original feature as the stone had been re-used as building material. The front is divided into three panels, of which that in the centre is complete, while the design of the lowest can be restored. Of the uppermost there remains only the margin suggesting a scene with human figures. The central panel contains a single rider armed with a long spear and small round shield. The technique, a low relief obtained by cutting away the background, leaving the figure with a broad flat surface on which the details are emphasized by incised lines, is the same as that employed on many of the Scottish monuments. The lumpy lifeless drawing of the horse, the grotesque disproportions of the human figure with its swollen head, and the elaboration of the incised detail suggest a comparison with Scottish sculptures of the late 9th or 10th century such as the cross-slab at Meigle,[3] and those at Dunfallandy[4] and Benvie.[5]

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[1] *Procs. Soc. Ant. Scotland*, 1941, LXXIV, 60–115.

[2] For a description of the stones and an account of the excavations see Hahne, Der Reiterstein von Hornhausen in *Mannus Bibliothek* no. 22, p. 171–80.

[3] E.C.M.S., no. 5, p. 300.

[4] ibid. 286.

[5] *Proc. Soc. Ant. Scotland*, LXXIV, pl. XLVIII.

It has little in common with the simpler and more lively representations of an earlier period of which the slab at Hilton of Cadbol[6] (*c.* 800) is typical. The lower panel contains two interlaced animals, the ribbon-like bodies enriched with triangular hatching. A close parallel to this design is found in the dragon on the 10th century slab at Wamphray[7] which Collingwood claims as Norse. A similar dragon and horseman are found one on each side of a cross-slab at Aberlemno[8] which, on the evidence of the Pictish symbols and of the general design, should be attributed to *c.* 900. If the comparison with the Scottish series is valid, all these considerations point to a date in the 10th century for the Hornhausen stone.

Another slab found on the Salberg contains a ruder version of the same designs and is clearly a rough copy of that already described. Smaller fragments fall into the same group. One has representations of deer in the same technique and these are related to the beasts which appear in the hunting scenes on several Scottish slabs. One or two fragments retain the edges undamaged, showing a broad flat margin enclosing the top and sides of the slabs, which appear to have been designed to stand at the head of a grave. The whole group is an isolated phenomenon in the early medieval art of Germany, though the local school survived long enough for the original sculptures to be imitated by less skilful craftsmen.

Hornhausen lies in the administrative district of Oscherleben to the west of Saale, some 25 miles southwest of Magdeburg. Till *c.* 600 this region was occupied by the Germanic Thuringian tribes.[9] After that date it falls within the area producing Slavonic finds,[10] and the name Oscherleben is itself of Slavonic origin. The Carolingian advance restored it to the Germans and though the 9th century frontier ran west of the Saale it included the district of Oscherleben. This is confirmed by the absence of the ring-works, which formed local centres of Slavonic administration in the struggle against Imperial penetration. With the German advance in the 10th century conditions became more stable, and the establishment of the archbishopric of Magdeburg in 968 marks the absorption of these provinces into the

[6] ibid. pl. XLIII.

[7] Collingwood, *Northumbrian Crosses*, 55, fig. 69.

[8] *Proc. Soc. Ant. Scotland*, LXXIV, pl. XXXIII.

[9] *Mannus Bibliothek*, no. 22, p. 95–107; cf. p. 118.

[10] ibid. p. 116–33.

normal Imperial administration. That the Hornhausen sculptures are neither Thuringian of the 6th century nor of the succeeding period of heathen Slavonic rule needs no demonstration. A date before 800 is therefore inadmissible and the appearance of this isolated school of sculpture in the troubled frontier region of 9th century is highly improbable, so that history leads us to a conclusion similar to that suggested on stylistic grounds.

German scholars have compared these stones to Viking monuments ;[11] but the similarity between the technique and design of the slabs at Hornhausen and the Scottish series is close, and such resemblance as the former show to Viking work is probably due to the inspiration which both found in Saxon art. Scottish influence on this remote frontier of the Carolingian empire might seem even less likely than Viking inspiration, but the life of St. Cadroe points to a possible though unproven connexion. This Scottish saint is said to have been a member of the royal house of Alban. He left his native land at the end of the reign of Constantine MacAedh (*c.* 945) and proceeding to Lorraine became successively Abbot of Wassor (near Dinant in modern Belgium) and of Metz. He held the latter monastery at his death in 988. His life,[12] written by a disciple who had a local interest in Lorraine, tells us little of his Continental mission of over forty years. The conversion of the frontier along and beyond the Elbe was then in progress, and it is by no means impossible that Saint Cadroe won his title to canonization as much by missionary activity on the frontier as by his pastoral work in less heroic scenes in Lorraine. If this conjecture be admitted the stones at Hornhausen could have been the work of the saint or of some companion of his pilgrimage. It must be confessed that evidence is entirely lacking, though the agreement in date is strange if it be no more than a coincidence, as Cadroe is the only Scottish saint whose activity in the Empire is recorded.

C. A. Ralegh Radford.

'THE STRATEGY OF ANGLO-SAXON INVASION'

These notes ' point a moral and adorn a tale '. The moral is that Archaeology and History, whenever it is possible to use both, run best in double harness. Now for the tale.

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[11] Hahne, ibid. p. 179.

[12] *Acta Sanctorum Martii*, vol. I, 469 sq.

It concerns Mr Dauncey's profoundly interesting paper in the current issue of ANTIQUITY (March 1942) on 'The Strategy of the Anglo-Saxon Invasion'. Seldom have I read a paper which irritated, excited and tantalized me more. Mr Dauncey, by the way, has been keeping dangerous company. Everything seemed all wrong about his argument and yet, I felt, there was something right about it somewhere. I lived with it for three days and three nights, reading it, re-reading it, and thinking it over, before I found out what this sound substratum was and when I had found it I saw at once that it was so important, so inevitably right, that nothing else mattered.

It can only have been Direct Inspiration which led Mr Dauncey to isolate this series of 'pure' cremation cemeteries lying between the Yare and the Humber.

The 'chateau' he has painstakingly but ill-advisedly built on this sure foundation is certainly 'en Espagne'. It is however equally certain that he is profoundly right to isolate these sites and connect them with the activities of an army which, from its headquarters in the north of Norfolk, controlled and patrolled Ermine Street from Castor to the Humber in middle v. Where, I maintain, he is entirely wrong is in asserting that this army was either an invading force or had, at any rate during the opening years of its history, any direct part in the Teutonic settlement of the Fenland region.

I shall now take the liberty of pulling down Mr Dauncey's house and setting up another on the same footings.

My first step is to produce historical evidence to prove that these cemeteries indicate the presence in this region of a mercenary army hired by Vortigern to fight against the Picts; that this army was commanded at first by Hengist and later by his son, Aesc, and that it commenced operations about 446 and maintained control here for some forty years.

The fact that it is demonstrable that during this period large numbers of Saxon and Anglian pioneers settled in the Cambridge region and in the basins of the Fenland rivers is, in the present context, neither here nor there. All that we are now concerned with is the circumstances under which this military force first made its appearance in these parts. It is, of course, obvious that once it was there, the incoming colonists must have profited largely, if only indirectly, from the fact that they had a friendly army in the background. And since this army was, at any rate during the opening, crucial, years of this process, acting in concert with the natives and was hence, presumably, on terms

of friendship with them, infiltration must have been, at the moment, comparatively easy.

My evidence for the procession of historic events which I have indicated above is the result of collecting stray hints dropped by such medieval and earlier authorities as Henry of Huntingdon, Geoffrey of Monmouth, Florence of Worcester, Nennius and Bede.

Henry of Huntingdon, at the beginning of book II of his Chronicle records ' a battle fought by the Saxons against the Picts and the Scots, who had penetrated as far as Stamford, in the south of Lincolnshire forty miles from this town of that name '. He adds : ' The Northerners fought with darts and spears while the Saxons laid on with their battle axes and long swords till the Picts, unable to withstand the weight of their onset saved themselves by flight '. This sounds like an echo from some forgotten epic.

Geoffrey of Monmouth in his ' Historia Britonum ', book VII, chapters X and XI, gives a fuller account of an event which can only be this same battle but he does not mention Stamford and places the fight north of the Humber. He prefaces his account with a description of how Hengist and Horsa arrived in Kent ' in three long galleys full of armed men ' ; were received in audience by Vortigern and offered him their services to repel the Picts, which he accepted, saying : ' I am hard pressed by foemen on all sides, if you take my part in battle against them I will reward you with lands and other gifts '. After they had driven out the Picts, Geoffrey adds, Vortigern granted the ' Saxons ' substantial tracts of land in Lindesia. According to Geoffrey the settlement in Thanet followed later.

Florence of Worcester tells us, under the years 447–449, that ' the Angles, by the unanimous counsel of the Britons under their king Vortigern, were invited to come over and defend the country. . . . These, in the first instance, expelled the enemy they were summoned to encounter '.

In Bede's *Ecclesiastical History of the Tribes of the Angles*, we read, book I, chapter 14, that between 450 and 455 the Saxons were invited into Britain and came in three long ships ' and by the king's command were appointed to dwell in the east part of the land . . . encountering with the northern enemy the Saxons had the better '.

Nennius, in his *Historia Britonum*, chapter 50, asserts that Aesc, after the death of his father Hengist (488) returned to Kent, and assumed the crown, ' from the sinistral parts of the island '. Since he wrote ' sinistral ' it is obvious that, as he wrote, he was facing east and must

have known of some facts connecting the earliest ' Saxon ' arrivals with the northeast, whence Aesc came again to Kent.

Now collating these evidences we arrive at the following story, evidently derived from some lost source of which our witnesses shared a common knowledge: about 446, after the failure of the appeal to Aetius, Vortigern invited Hengist and his war band to come in and repel the Picts. The invitation was accepted, and at Vortigern's instance the mercenaries took up their quarters, somewhere south of Stamford, on the east coast. Shortly after a Pictish host of marauders swept down Ermine Street, and reached Stamford. Hengist and his band, presumably passing over the Denver Causeway, moved rapidly to intercept their advance, drove them back forty miles and inflicted a severe defeat on them in the region of the Humber. As a result of this victory he set up an advanced base, on the banks of the Humber, in Lindsey, as a check to renewed Pictish hostility. It only remains to add that, on Nennius's showing, a Germanic war band under Aesc was still operative in the northeast in the last quarter of v.

This historical claim is not without other archaeological support than that of the cremation cemeteries. My friend, Mr Christopher Hawkes, with whom I discussed it some year or more ago, told me, in a subsequent communication, that ' pot-sherds of the distinctive Kentish type were found at Elmswell (or was it Brough-on-Humber ?) ' When this tyranny is overpassed and opportunity allows I intend to take this matter further but, even without more inquiry, in view of the proximity of both these sites, just over Humber, to the Ermine Street passage of the river, the importance of these sherds as evidence of the historicity of these traditions is enormous.

The above account admittedly raises some minor problems, and its later phases are obscure, but, nevertheless, it is intelligible and coherent. I shall hope to elaborate it one day. Meanwhile I leave it to the reader to place my historic superstructure on Mr Dauncey's archaeological foundation in the sure and certain hope of a solid and impregnable result.

I would conclude these notes with an expression of very real gratitude to Mr Dauncey for having so courageously put forward his thesis. The fact that, if I am right, his conclusions are mistaken, in no way detracts from the credit he deserves for his perspicacity in isolating the ' pure ' cremation cemeteries in these regions and so making possible a valuable contribution to Dark Age history in our island.

T. Dayrell Reed.

THE NATIONAL BUILDINGS RECORD

The study of English Architecture has by no means been neglected in this country—as an extensive library of volumes attests—and until it became the fashion to discourage the practice, architectural students were wont to go far and wide with sketch-book and measuring rod to note the work of their predecessors. But England has lagged behind its continental neighbours in the systematic and official record of native building; and until 1894, when London was taken in hand by the London Survey Committee (later aided by the London County Council), and the subsequent appointment of the Royal Commissions on Historical Monuments for England and Wales, no detailed regional surveys of architecture had been attempted. When therefore there occurred the intensive air-raids which were so destructive of London, Coventry, Bristol, Southampton and Plymouth, public uneasiness was aroused at the neglect of an obvious duty. On 18 November 1940, at the invitation of the President of the Royal Institute of British Architects a Conference of delegates from societies and public bodies was held, and as a result the NATIONAL BUILDINGS RECORD was inaugurated with an advisory Council, representative of the best knowledge of the subject in all its aspects, presided over by the Master of the Rolls. The Ministry of Works and Buildings took an active interest in the scheme and obtained a grant from the Treasury to assist in launching the good work. Mr Walter H. Godfrey was appointed director and Mr John Summerson deputy-director, and rooms were eventually provided at All Souls College, Oxford. Important aid has since been given by the Courtauld Institute of Art, which sent its Conway Library of photographs together with its librarian Mr Cecil Farthing to join the Record at Oxford.

The work of the Record falls into three main categories :—

(*a*) Preparation of lists of buildings of merit and their classification ;

(*b*) Collection of information of existing records and transferring it to the Central Index ;

(*c*) Making new records (where these are lacking) of buildings and their details, including war-damage.

In normal times these three classes of work would be taken in sequence, but the present danger makes it necessary to speed up the Record, which cannot wait for prior investigation in any complete form.

The listing of buildings has however been attempted in collaboration with the panel architects appointed by the Ministry of Works and

Buildings to deal with bomb damage. The whole country has been divided up into areas in the charge of over 300 architects, and most of these have produced preliminary lists of buildings which are available for immediate use. They will require much sifting and amplification and all those who have local knowledge and skill in these matters can help. The index prepared during the last ten years by the Architectural Graphic Records Committee is being used as a base for the new Central Index, which is in two parts ; (*a*) original drawings and engravings and (*b*) photographs. These indexes are being daily enlarged and expanded.

The National Buildings Record is employing a limited number of staff photographers in the vulnerable areas, and London in particular has been photographed extensively. The two Royal Commissions on Historical Buildings for England and for Wales are assisting, and the Record is in close touch with the Central Council for the Care of Churches. But it is also necessary to organize voluntary effort all over the country, and local Committees have already been formed to attract the help of architects, antiquaries, artists and photographers who are in a position to give assistance. It is particularly desired to trace all public and private collections of architectural negatives and to secure prints for depositing in safety. In twelve months the Record has collected some 13,000 records. It should double these accessions in the next year if it is to make any appreciable impression on its formidable task.

Reviews

A STUDY OF SOME EARLY ISLAMIC TEXTILES. *By* NANCY PENCE BRITTON. *Boston : Museum of Fine Arts*, 1938. *pp.* 89 *and* 100 *illustrations in collotype.* 3 *dollars* 50 *cents.*

Here is a work which is not only a valuable study of textiles but also light in the hand, delightful to read and a pleasure to the eye. It has evidently been a labour of love to all who have been concerned—author, advising experts, printer, photographer and binder. They have done justice to attractive material: early Islamic types chosen from the collections of the Museum of Fine Arts, Boston, dating from the eighth to the thirteenth centuries. The illustrations give as good a reproduction of them as is possible without colour—the ' vivid red, green and blue ' of the Egyptian tapestries of the Abbasid period ; the more delicate and varied shades of those of the Fatimids ; the brilliance of the embroidered silks ; the striking contrast of the painted gold and black inscriptions on the blue brown and white of the *ikat* cloths—these have to be imagined except by the fortunate few who have seen the pieces described, or those of the period in the Arab Museum of Cairo.

Full use is made of new knowledge to assign provenance and dating to the pieces in the collection, and here the author is fortunate, for it includes many *tiraz*, i.e. textiles with ornamental inscriptions, whether woven, embroidered or painted. In the civilization of Bagdad, the ' City of Peace ', and also, later, in Cairo, men of substance satisfied at one and the same time liking for fine clothes, passion for calligraphy and over-ruling piety, by wearing robes decorated with inscriptions on sleeve or turban, as is shown in the illustrations from ceramics and MSS on figs. 96–100. These inscriptions begin, as any piece of work should, with the Bismillah, then comes the name of the Caliph, with ' God strengthen him ' or other aspiration, the place of the making, and sometimes the date as well. Such textiles were already in vogue in the days of Harun el Rashid; according to Makrisi not only as apparel but also as hangings, for he describes a veil with inscriptions sent to the Ka'aba at Mecca in the year 190 (A.D. 806). This latter use persisted to our own days, for the covering of the Mahmal sent from Cairo on the pilgrimage was ornamented with inscriptions embroidered in gold. The Museum of Boston is not so fortunate as to possess a *tiraz* with the name of Harun upon it like the fragment in Berlin, but the author tells us that ' if we wish to indulge our imaginations we may legitimately suppose that the earliest

of our Mesopotamian textiles (figs. 1–3) were in existence in his reign '. Twenty-one of the pieces following bear the names of later Caliphs, the earliest, fig. 4, that of El Muqtadir (A.D. 932), and the latest fig. 83, that of El Hafiz (1130–1149). From these dated pieces others similar in style and ornament have been assigned to the same period.

A new feature is the careful study of method and material, especially the analyses of the fibres of the thread made by Mr William Young. As the author says : ' The material of the threads is another helpful factor in determining the provenance of textiles. Those with a linen ground generally come from Lower Egypt ; those with a wood ground seem to come from Mesopotamia, the Fayoum, and Upper Egypt ; those with a silk or *mulham* (i.e. raw silk warp and cotton weft) from Persia and Mesopotamia ; and with a cotton ground, from Mesopotamia and the Yemen '. It is a pity that experiments with dyes on the line of those made by M. Pfister could not have been undertaken for the Boston collection. However, his discovery that the appearance of a new red dye, the Indian lac, coincides with the time of the Arab conquest, was found useful to place certain pieces formerly believed to be pre-Islamic.

After discussion of the main groups from Mesopotamia and Egypt, a peculiarly interesting section deals with two *ikat* (tie-dyed) cloths, figs. 91, 92. These have votive inscriptions without date, but a similar piece in the Arab Museum at Cairo has an inscription stating that it was made at San'a in A.D. 932. This supports the theory here advanced that the *ikat* cloths are identical with the striped stuffs of the Yemen frequently mentioned by Islamic writers. This Yemenite origin is only claimed for the cotton pieces ; two in linen, figs. 73, 74 are listed from Egypt. The three *ikat* illustrated, figs. 73, 91, 92, all show the same kind of ' stepped ' pattern, with the jagged flame-like edge characteristic of the technique ; they are ' toiles flammées ', as one old French variety is termed. The latter were tie-dyed in the weft, but the ancient Islamic cloths in the warp. In this respect, and in the ' stepped ' pattern, there is a close parallel to them in some modern silk and also cotton cloths I have seen in Aleppo. These Syrian *ikat* are only made by certain Christian families who preserve the secret of a craft handed down through many generations. The skeins are tied and dyed three times, for yellow, red and blue, then, so I was told, pushed up higher or lower during the warping to give the stepped effect. The resemblance of the pattern of these cloths is so close to that of the ancient ones that it looks as if there must be a real descent from them.

The description of the textiles is accompanied by a chronological table ; a well selected bibliography, to which one new work can now be added, i.e. C. J. Lamm, ' Dated or datable *tiraz* in Sweden ', *Le Monde Oriental*, XXXII, 1938, and a map of sites significant in the history of Islamic textiles.

Welcome additions would have been enlargements or drawings, showing details of the way in which the embroidery stitches mentioned were combined, and a diagram—or at least, a description—of the ' twill tapestry ', fig. 24.

The book is a notable contribution to the growing body of research on Islamic textiles. G. M. CROWFOOT.

FROM HUNTER TO HUSBANDMAN. *By* J. W. PAGE. *George G. Harrap*, 1939. *pp.* 256, 59 *illustrations*, 3 *maps*. *7s 6d.*

The aim of this quite small book is to present in easy but not over-simplified form the main characteristics of food-gathering societies and the origin and development of pastoralism and agriculture and their leading social implications. The author's *Primitive Races of To-day* is a sketch of modern primitive hunting, pastoral, and cultivator peoples, drawn on similar lines, and in this book he seeks to cover ancient and modern communities alike. The first eight chapters deal with palaeolithic, mesolithic and modern hunters, fishers and collectors, their material culture and social characteristics. The modern side is drawn mainly (as the bibliography acknowledges) from Forde's *Habitat, Economy, and Society*, Sayce's *Primitive Arts and Crafts*, Lowie's *Introduction to Cultural Anthropology*, and the like ; for his prehistoric archaeology the author has used Sollas's *Ancient Hunters* and the well-known small books by Burkitt, Leakey, and Peake and Fleure, together with the British and Horniman Museum Guides and a selection of articles in ANTIQUITY and other periodicals. The virtues of the result are mingled with the faults of all such writing based on secondary authorities treated as though they were primary. The even surface of its outward simplicity conceals a somewhat uneven content of value. For the author must not only reconcile or pick his way between his sources where they conflict (as e.g. all the authorities just cited on the palaeolithic), but he must reckon with an unknown quantity of sins of omission. And many of these mar not only the factual, but the popular value of his writing. For example, not only does he here make such a ' chestnut ' mistake as putting Le Campigny in as a site of the Mesolithic age, but he knows nothing at all of (for example) the palaeolithic winter-houses of Russia, and in fact misses the whole subject of the seasonal factor in prehistoric life, which could have made his account of the ancient hunters so much more vivid and natural. He has very little about hunting magic and no illustration of Cave art, and as for the Mesolithic, he has missed the works of Grahame Clark altogether. The account of the origins of pastoralism and agriculture is drawn largely from Peake and Fleure, and from Childe's *New Light on the Most Ancient East* ; Hilzheimer's ANTIQUITY articles on animal breeds have been used, and on cultivable plants the material to be found in Peake's *Origins of Agriculture*. The resulting picture of early

farming in the Near and Middle East is supplemented by some use of Curwen on agriculture in prehistoric Britain, and there is a fair abundance of ethnographical matter about pastoralism and cultivation in modern primitive societies. After two quite well illustrated chapters on agricultural implements and devices, the author concludes with some simple generalizations on the social changes involved by the adoption of agricultural economy, and on its religious counterpart in the rise of fertility-cults.

Throughout, he has been at pains to be interesting and intelligible to the general reader, and he very properly quotes from Childe's *Man Makes Himself* to emphasize the danger of imagining that the social and spiritual structure of prehistoric life can be safely inferred from that of modern primitive communities (e.g. the Australian) in a like stage of material or economic development. He has in fact aimed at writing not only a bright but a sound little book, and people possessed of specialized archaeological or anthropological knowledge should beware of disdaining this sort of aim. For it is through the attractive popular summary or small textbook, almost alone, that that knowledge can be distilled for the benefit of the public and the school-child. But a man who writes a popular book must be properly acquainted with his subject. And the author of this one has not stayed at school with archaeology long enough. Hence his shortcomings. May he be able to turn to and make them good before he publishes again. C. F. C. Hawkes.

EARLY POTTERY OF THE JEBELEH REGION. *By* Ann M. H. Ehrich. Memoirs, vol. xiii, December, 1939. *Philadelphia : American Philosophical Society. pp.* 129, 24 *plates*, 3 *figures. Paper*, 2 *dollars.*

The subject-matter of this study comes from soundings made in 1934 by Dr E. O. Forrer, on behalf of the Bryn Mawr College Expedition to Cilicia, at two sites on the coast of Syria, near the modern Jebeleh, south of Ras Shamra. At one of these, Qal'at er-Rus, the exploration trench was carried down to bedrock through 11.20 metres of débris, in which nineteen layers of occupation were distinguished ; at the other, Tell Sukas, a trench 7.35 metres deep disclosed seven layers, of which one, layer 5, is subdivided into three levels.

The pottery, which was handed over to Mrs Ehrich for publication, is extremely fragmentary ; a bare half-dozen of complete shapes appears among the numerous drawings of rims, necks, bases and handles on plates v to xi. The study of this material is based primarily on fabric and decoration, and a method of distinguishing local from imported wares by the use of the petrographic microscope is described by Dr Dorothy Wyckoff and illustrated. Mrs Ehrich has catalogued the unpainted wares under twenty heads with more or less self-explanatory titles, such as Early Reserved Slip, Natural Burnished

Ware, Combed Ware, Scrabbled Ware and so forth. The distribution of the types at each site is shown in tabular form, but it might be wished that the characteristics of the successive layers had been treated more fully than is done in the brief summaries on pp. 49 ff.—(Qal'at er-Rus) and 86 ff. (Tell Sukas). Doubtless, however, this very careful and detailed study is intended primarily to assist excavators in Syria and the neighbouring countries in working over their material; for this purpose it should prove extremely useful and should have a place in every expedition library.

The three lowest layers of Qal'at er-Rus are classified as chalcolithic and layers 16 to 5—which together amount to a depth of only 5.70 metres—as of the Early Bronze Age. The latter part of this period, from layer 10, is designated as the ' stump-base ' period (though it is by no means clear that any jugs with bases of that form were found even as low down as layer 8) and is dated 2800–2400 B.C. At Tell Sukas the lower layers (7, 6 and part of 5) also come within the stump-base period, but layers 4–2 contain wares not found at Qal'at er-Rus, where a gap, believed to extend from about 2300 to 1800 B.C., appears between the occupation of layer 5 and that of layer 4. A burial containing a torque and other bronze objects and crystal and carnelian beads, which was discovered in the exploration trench and which is dated by Mrs Ehrich to the 19th or perhaps the 18th century B.C., is not in itself evidence that the site was deserted, as the custom of interment below the floors of houses was characteristic of that period.

The surface strata of both mounds were too disturbed to admit of precise classification, but up to the early part of the Middle Bronze Age the two sites between them provide a continuous sequence of pottery types. The absolute dates assigned to the various layers are in accordance with accepted chronology, but the adoption of the stump-base period as a criterion suggests certain difficulties.

At Qal'at er-Rus, as several Palestinian sites—Megiddo, Jericho, Beisan—the juglet with elongated stump base is not among the earliest types of Bronze Age pottery and would surely never have been dated to the beginning of the third millennium had it not been found (with other Syrian types) in the royal tombs of the First Dynasty at Abydos. At Megiddo, for example, a duration of over a thousand years is assigned to three strata (XVIII–XVI) which display a remarkable uniformity in shapes and fabrics. This long dating seems still more difficult to accept when we adjust the chronology of Syria to the lower dates now accepted for the First Dynasty of Babylon. It therefore looks as though there may be some flaw in the Egyptian evidence. At all events the question whether the Syrian pottery at Abydos is not later in date than the tombs themselves ought to be seriously considered, though naturally we should not look for any such digression in the study under review, which is only incidentally concerned with questions of absolute dating.

G. M. FITZGERALD.

ΔΡΑΓΜΑ: MARTINO P. NILSSON AD. IV ID. IUL. ANNO MCMXXXIX DEDICATUM. Skrifter utgivna av Svenska Institutet i Rom, ser. 2, vol. 1. *Lund*: *C. W. Gleerup*; *Leipzig*: *O. Harassowitz*, 1939. *pp.* 656, *with* 95 *illustrations. Price not stated.*

The word Δράγμα is given by Liddell and Scott as meaning ' as much as one can grasp : a handful '. This book weighs some four pounds, and contains 656 pages and 38 different articles, so the title is really not a bad choice. It is the *Festschrift* published by the Swedish Institute in Rome for the 65th birthday of Professor Martin Nilsson, Rector of the University of Lund, and dedicated to him by a great company of scholars and institutions of many countries, with the Crown Prince Gustaf Adolf at their head. It is in its kind a fitting monument to an age and a conception of European scholarship which the war has now done to death, and which its survivors will only replace by something better or as good with much travail of faith and work. The spectacle of Professor Nilsson's career should certainly help to inspire that travail. The bibliography of his writings here set out runs to 705 items, covering 81 pages, with 4 pages of encyclopaedia-articles in addition, and in time extends up to 1939 from 1897. As is well known, the Professor's scope is wide, and the contributions to this volume are spread broadcast over it : they range through classical philology, Greek and Roman architecture and art, Mycenaean and prehistoric archaeology, and a large field of mythology and comparative religion.

The first category cannot be dilated on here, but its borderland with prehistory is illumined by E. Wiken's article (540–552) on the evolution of Greek beliefs, before the voyage of Pytheas in the later fourth century B.C., about the northern limit of the inhabited world, with special reference to the Rhipaeans and the Hyperboreans. Northern prehistorians will appreciate Otto Rydbeck's study of the use of stone tools and weapons in the Swedish Bronze Age (430–443), contributing as it does to the modern reaction against the old typological chronology of Montelius ; useful association-evidence is given for the Bronze Age date of the evolved form of thick-butted flint axe, and for certain stone battle-axes likewise. One is reminded of the battle-axe by the remarks about Thor in E. Arbman's article (20–40) distinguishing ' mythic ' thought, arising from really primitive anthropomorphism, and ' religious ' thought, contemplating gods as wholly divine and supernatural. Homer, while his conception of Zeus is almost wholly ' religious ', treats the other gods in his narrative (though very often not in his characters' observations) for the most part ' mythically ' ; similarly Thor, whom men worshipped and prayed to in the North, appears in the poetic Edda as a terrific warrior-hero, hurling his deadly hammer at giants and trolls. How many archaeologists realize that its archetype, the prehistoric battle-axe or axe-hammer, must have been a missile as much as a hand-to-hand weapon ?

Other interesting articles in this field are E. Briem's (157–169) stressing the basic difference between totemism and animal-worship (the Egyptian animal gods have nothing totemic about them), and an ingenious study by Axel Persson in Greek legend and Mycenaean iconography (379–401). He starts with the superb royal seal-stone that he found in the great tholos-tomb at Dendra, showing a lion preying upon a bull, and elaborates his theory that the lion was the emblem-beast of Mycenae, the bull of Crete, and that the legendary exploits of the lionskin-clad Heracles stand for successive victories of Mycenae over Nemea (emblem also a lion), Lerna (emblem a hydra), Erymanthus (a boar), etc., culminating in the triumph over the Cretan bull, symbolized on this seal-stone, which will be the renowned Fall of Knossos about 1400 B.C. His case for Oriental emblem-beasts in the Mycenaean world, and his interpretation of the duplet legends of the Cretan bull's abduction of Europa and Pasiphae (personifying the Oriental moon-goddess) are cleverly argued. But if one is really to make Heracles a Mycenaean field-marshal, one should surely follow Myres in making out of the heroic pedigrees a systematic chronology to fit him into, in which case he must belong to the 13th century B.C., not to the latter part of the 15th, as Persson's theory requires. And what about Theseus, whose slaying of the Minotaur gives him at least as good a claim as Heracles to be hailed as the matador of Knossos ?

To turn to more sober themes, we have Einar Gjerstad on the architectural history of the *comitium* of Republican Rome (206–221), and Axel Boethius on Vitruvius and the architecture of his age (114–143). Three Attic vases are discussed by Å. Åkerstrom (553–567), a fifth-century Etruscan terracotta head by A. Andren (1–19), an unpublished portrait-head of Augustus by H. P. L'Orange (288–296), and by F. Poulsen (409–418) a powerfully disagreeable portrait-head from Republican Rome, now in the Ny Carlsberg, which is compared with another in the Museo Mussolini, equally disagreeable, but as a caricature of Mussolini really quite good. This short selection shows what a varied banquet is here offered in the polymathic Rector's honour. The one factual study of a prehistoric site is dealt with separately below.

C. F. C. HAWKES.

PUNTA DEL TONNO, eine vorgriechische Siedlung bei Tarent. *By* GÖSTA SÄFLUND. *pp.* 458–490 *of the work reviewed above.*

Dr Säflund's monumental book on the North Italian Terremare (reviewed in ANTIQUITY XIII, 370–3 and 489–90) has established him as one of the most considerable figures in the much-neglected study of Italian prehistory, and this article on a famous South Italian site, long falsely proclaimed to be a Terramara itself, is to be welcomed as a pendant to his larger work. The prehistoric

settlement on the Punta (or Scoglio) del Tonno, overlooking the Mar Grande or outer harbour at Taranto, the ancient Tarentum, was excavated by Quagliati in the years around 1900, and Säflund's article is a fresh presentation of the evidence in the light of modern knowledge. The stratigraphy was fairly clear. At the bottom (*c.* 2.20 metres) was a Chalcolithic level (I); next came a pure Bronze Age stratum (II), divided into two, with bases about 1.90 and 1.15 metres (IIA, IIB); and above, a further stratum (III), less plainly divided into a Late Bronze Age layer based at about 0.75 metres (IIIA) and an Early Iron Age layer (IIIB) running up to the later pavement at about 0.50 metres which sealed the whole. The near-by Greek colony of Tarentum was founded in 706 B.C., and this must give a limit for the prehistoric occupation. Strabo (VI, 279) records from an older source (Antiochus) the colonists' hostile policy to the natives, and further, that the latter were Iapygian barbarians, with whom there were also Cretans. When the Cretans had arrived is not clear, but perhaps the tradition of Cretan immigrants among the Iapygians looks back to Late Minoan times. The earliest Aegean pottery at Punta del Tonno appears in stratum IIIA, and is dated for Säflund by A. Furumark 'Mycenaean (=L.M.) III C 1 (early)', i.e. just before 1200 B.C. What follows in stratum IIIB is Protocorinthian, which takes one from about 800 to the extinction of the settlement a century or so later; the native pottery with it includes Illyrian or trans-Adriatic types, and just the tail end of the Italian tradition of white-encrusted ornament and variegated handle-forms. But the latter can hence be followed back through IIIA, into the full Bronze Age of II. IIB was characterized by a number of bronzes, including violin-bow fibulae and not earlier than 1300. IIA then runs back from about that time; its initial dating can only be arrived at from a general assessment of the age of the white-encrusted, handled pottery, which is the same as that of the middle stratum at Coppa Nevigata on the Adriatic coast, and defines what Rellini has named the Apennine culture.

This culture not only embraces all the east of Italy up to the Marche and the margins of the Terramara district inland south of the Po, but appears further west, e.g. at Monte Cetona in Tuscany and on the island of Ischia, where one of its typical handle-forms (*a nastro eretto*) has been found associated with a Mycenaean sherd (*Bull. Paletn. Ital.*, 1937, n.s. I, 78 f., fig. 3, and 72 ff., figs. 1–2), dated by Furumark between 1400 and 1350. Since in any case the culture wherever it appears is the sole and immediate Bronze Age successor of the Italian Chalcolithic, one would expect it to be in being certainly before 1400. But as Säflund rightly says, its coming here in South Italy makes a sharp break with its predecessor, and one wants to know not only when it came, but whence. Since its pottery, above all in the technique of white-encrusted ornament, seems to look across the Adriatic to the Vučedol and Slavonian tradition of the

outgoing southwest-Danubian Chalcolithic, Säflund would assign it to a general immigration from what is now Yugoslavian territory into Italy, which he would date about 1500–1450. It must be remembered, however, that Italian prehistorians repudiate this immigration. Rellini, in particular, believes that the Apennine culture, at least in the Marche where he has excavated so much of it, is native Italian on a home-grown Chalcolithic basis, merely incorporating trans-Adriatic elements from without. And Säflund has no evidence here in the south to prove Rellini wrong : his opening date for Punta del Tonno IIA at 1450 is simply a guess, and he cannot say how much earlier the culture may have begun further north, e.g. in the Marche, before it arrived on the Gulf of Taranto. Further observations on the Apennine culture, in regard to its relations with that of the Terremare, will be found in *Journ. Roman Studies* XXX, 89 ff. ; here it will suffice to say that Säflund's insinuation that its authors were everywhere Iapygians from Illyria, arriving *en masse* in the early 15th century B.C., seems to require taking with a good deal of salt. The specifically Illyrian element may well (for example) be argued to have appeared only in east Italy with the late pottery represented here in Punta del Tonno IIIB. For granting trans-Adriatic elements in the Apennine culture of the full Bronze Age, who is to say whether they can represent Illyrians (i.e. Illyric-speakers) so early ? What would Dr Pokorny make of such a Schuchardtian heresy ? (see ANTIQUITY XV, 96 ff., 100 ff.). However, the really important thing about this article is that Säflund has given us the facts about Punta del Tonno in modern terms, and all students of Mediterranean prehistory will be grateful to him for that alone.

C. F. C. HAWKES.

ROME AND CHINA. *By* FREDERICK J. TEGGART. *University of California Press*, 1939. *pp.* 283, *and* 14 *maps. Price not stated.*

This book contains an account of the wars on the Roman and Chinese frontiers from 63 B.C. to A.D. 117. Despite a long bibliography, the author mainly excerpts the rather scrappy ancient sources, with no account of modern archaeological or geographical investigations. The narrative is a chronicle, shifting from district to district every few years. The events are selected uncritically ; the advance on the British frontier bears no relation to the main theme. There is no reference to the reaction of Roman domestic politics on frontier-wars. In chapter III is a long discussion of the Eurasian tribes in the first century A.D.

The author's research was inspired by observing that upheavals on the Chinese border sometimes had repercussions on Parthia and India. This is true, for the Eurasian steppes formed a geographical unit, surrounded by organized states which could promote or resist troubles and were interested in

caravan-trade. The next thesis is more doubtful, that disturbances near the eastern end of the silk-route caused a collapse of the financial system of Parthia and rebellions in that country. There is no evidence that the Parthian nobility were shareholders of a trading company, who revolted when they received no dividends. Interruptions would have led to the discovery of new routes, not to a general upheaval along the old. The influence of climate or over-population on steppe-movements is dismissed cavalierly.

The account of the reaction of Rome's eastern frontier-wars on Danubian and Rhenish tribes is even more speculative. Rome had so many border-forays that it is not surprising that vague chronological correlations can be constructed. There is no evidence for the assumption that the unity of the Black Sea territories, constructed by Mithridates VI, endured after his death. In the description of Danubian trade-routes, the evidence is sometimes misinterpreted, and those which do not serve the author's thesis are omitted. It is difficult to see why local causes cannot have produced raids on the empire; and it is a large assumption that ancient historians were consistently misinformed about the wars they describe. The author has been led to his surprising theories because he has not studied the geographical and strategic conditions of the Roman northern frontier. He fails to note that central Europe consists of a long valley bounded by two mountain-ranges, and that the Romans were continually experimenting whether to draw their frontier along the river or the farther crests. He assumes that the Roman advances were always provoked by the barbarians, thus accepting the Roman official version. Modern research on the Gaetulian wars or on Livy's history has shown how warped this version was. Skilful and delicate propaganda have presented Rome in the guise of Plato's philosopher-king, undertaking her imperial mission with diffidence when her neighbours one by one compelled her to become the policeman of the civilized world.

O. DAVIES.